Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

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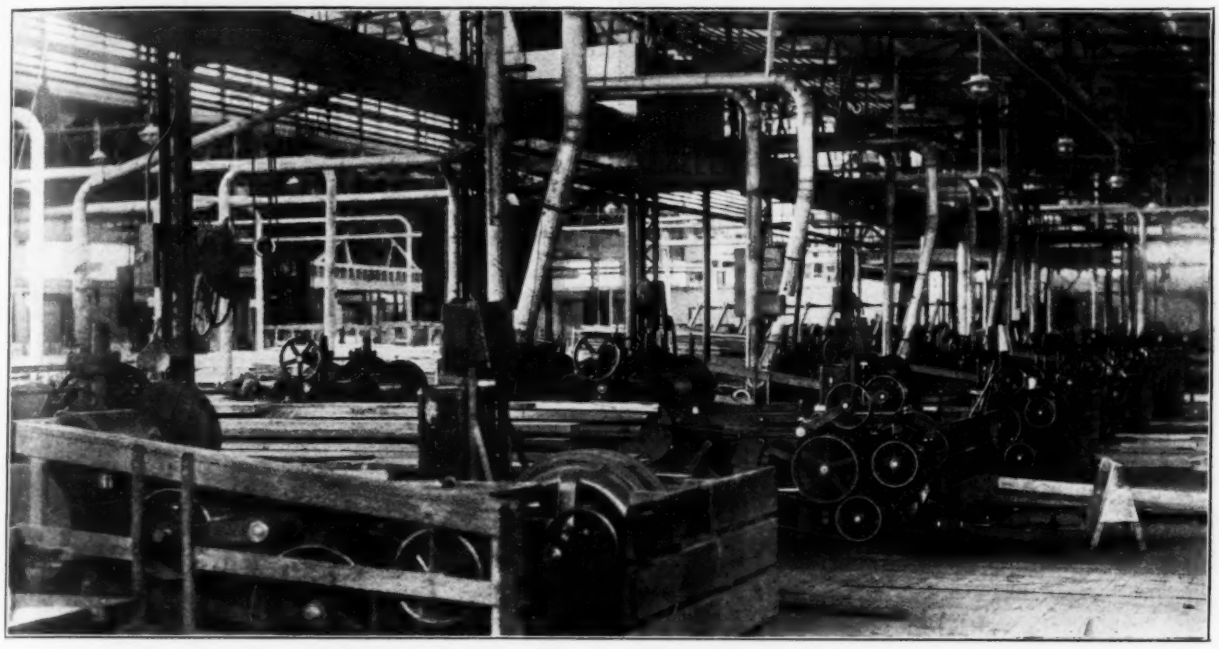


Group of Planers in Furniture Factory Driven by Individual Motors.

Electricity in Furniture Manufacture

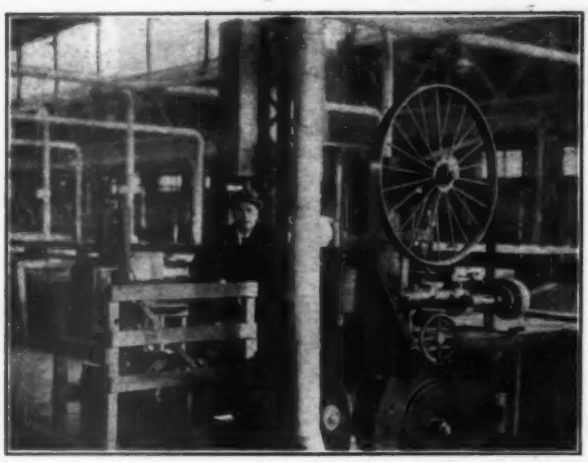
A Resume of the Advantages of Electric Drive and Central-Station Service and Data on Horsepower Requirements of Woodworking Machine

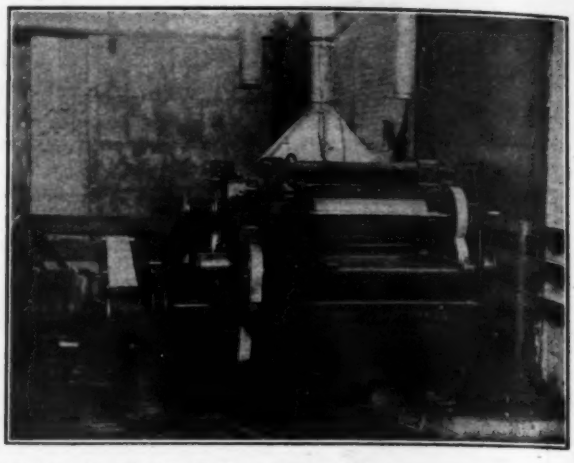
THE advantages of the electric drive for machines in furniture factories are becoming generally recognized by operators of such plants. The advantages referred to are greater safety and economy, the constant speed that may be maintained by the use of electric motors, the greater freedom from breakdowns, and the higher production secured. The appreciation of these facts is attested to in the gradual replacing of steam-power equipment with central-station service. The greater number of such changes are made in factories having access to central-station service. It is easy to understand the position of the operators of a factory, having good steam-power equipment, where the plant refuse is utilized as fuel for the boilers, and which in times past was considered a fuel free of cost. In more recent years, however, the sawdust, shavings and cuttings from a woodworking plant are finding a profitable market, such material being in demand for packing, insulating and wood pulp uses; and from them wood alcohol, acetic acid and other products may be extracted. The continued use of steam power, and the delay in adopting electric power in its place are caused in many cases by the availability of wood refuse for the boilers, and by the belief that this refuse would be discarded as waste if it were not used as fuel. When trade arrangements are once established for the marketing of this refuse at a profit sufficient to equal or overbalance its value as fuel at the plant, the principal reason for delay in putting in electric motors will disappear. Then, at plants in which refuse is used as fuel, it is observed that a certain amount of coal is required in addition to the wood waste. Each plant has its own problem, determined by local conditions, among which may be inability to reach a market for refuse, and remoteness from electric-power service.

Figures produced by competent research men demonstrate the commercial possibilities in treating wood waste. The results are thus stated: "When properly treated, every ton of theoretically dry wood, or 3200 pounds of green sawdust, will give

30 gallons of 188° alcohol at 40c	$12.00
76 pounds acetic acid at 6c	4.56
¾ ton of stock food at $23	17.25
Total	$33.81
Cost of production	7.00
Net value, per ton, dry wood	$26.81
Net value of product, per ton, green wood	16.80

"One and a quarter long tons, equivalent to about





Four-Inch Band Saw and 26-Inch Double Planer Driven by 20 and 35-Horsepower Motors.

1000 feet of lumber, when transformed into above products, has a value of $33.51. Assuming that it requires two tons of wood to equal one ton of coal in heating value, and that the net return from above process is $10 per ton, it is evident that sawdust is not the inexpensive fuel which it has always been considered."

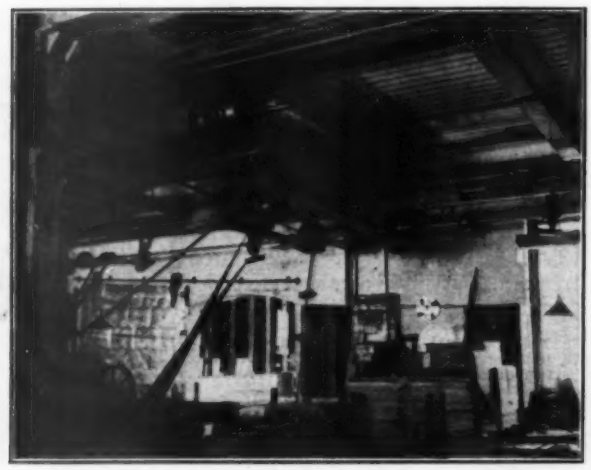
The above illustration only serves to show the value of products that may be made from wood wastes, and that this source of revenue may well be considered, especially by factory operators whose wood refuse amounts to 50 to 100 tons a day. Making due allowance for practical results of extraction falling considerably below the theoretical, these figures appear to show conclusively that if steam be supplanted by electric power there need be no loss and no waste occasioned by not using the mill refuse as fuel.

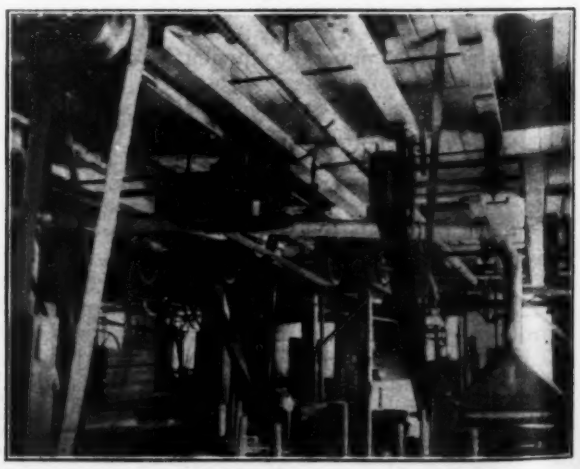
Putting aside the question of power costs, there are other considerations in favor of the electric drive for furniture factories which are real advantages that make for safety, economy and speed in production. In plants where electric power is used it is always possible to set the machines to the best advantage for operating, and with regard to the economy of floor space, and under such arrangements the motors may always be made adaptable. In steam-driven mills such advantageous installation of machines is seldom possible, because transmission of power often forces the setting of a machine in a position not otherwise desirable. The output of a mill is sometimes curtailed by reason of not being able to adjust machines and to use floor space to the best advantage. With motor drives, the machines may be placed to face any direction, suitable for the work, and as regards light and floor space.

The safety of employees is of paramount consideration, and rates for liability insurance reflect the conditions of greater safety that prevail in a modern factory having the electric drive. In these times, adequate safety appliances as well as high wages are demanded by the best class of workers.

In order to meet existing competition the manufacturer requires reliable power, constant speed and steady operation, all of which are best attained through the use of the electric drive. Some motors are so constructed that constant speed, from no load to full load, may be maintained, securing steady operations under those varying conditions. Then, if one machine or one motor should be out of service the operations of the others may continue without interruption. The upkeep costs of operating woodworking machines are high, which is due to the necessity for having high-speed machines with high belt tensions, causing heavy wear on belts and bearings. In order to arrive at upkeep charges, the loss of production during time of making repairs must be added to the repair costs proper; and it is evident that the losses occasioned by breakdowns amount to no small sum.

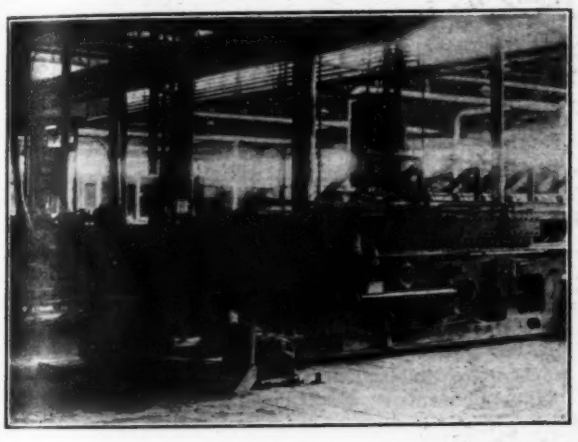
The electric drive in furniture factories secures greater cleanliness and minimizes the fire risk. The





Views in Woodworking Plant Showing Motors Suspended From Ceiling.

adaptation of electric power to such plants may be by means of the individual motor for each machine; or the group drive, in which several machines are driven from one motor through a short line shaft; or by means of a combined individual and group drive. Manifestly, the higher load-factor and low first costs are attained through the arrangement last named. While the large machine is always operated by its own motor, the small machines are usually grouped to good advantage and driven by one motor. This makes a flexible condition, as all machines are not necessarily operated continuously; and the one motor used need not be equal in capacity to the combined capacity of all the machines. A case may be stated of five machines, each requiring a 5-horsepower motor. If all were operated at the same time, the peak of the load, or maximum power requirement, of all will not come at the same time, nor be continuous; so instead of installing five motors of 5 horsepower each, or one of 25 horsepower, it is shown that a motor of 15 horsepower may serve the purpose. Such an installation, under a group-drive arrangement, economizes in both



Dovetailer and Planer, Motor-Driven.

cost of equipment and of operating. In some cases of an individual motor for a large machine, the motor and machine are direct-connected through couplings. Belt connections are usual for planers where power is delivered to the machine at more than one place. Modern woodworking machines are now so designed as to adapt them to the electric drive; and in some cases the machine is constructed with a motor as an integral part of it. This kind facilitates matters where a new installation is being made.

In making a change to fit old equipment to electric power, the problem of securing motors of sufficient capacity, but not so great as to make unnecessary expense, usually requires skilled attention.

Below is given a list of woodworking machines in a typical furniture plant, with the motor capacity required for each machine or group of machines, all motors designated being 3-phase, 60-cycle, 220 volt:

1—5-hp. motor, group drive for
  1 Carey double cut-off saw,
  1 No. 1 Porter spindle shaper,
  1 No. 1 Porter carver.
1—7½-hp. motor, belted direct to
  1 A-48 American sander.
1—1-hp. motor belted to line shafting to
  1 small emery wheel,
  1 12-in. wood-turning lathe,
  1 filling machine.
1—2-hp. motor belted direct to
  1 Crescent single-spindle shaper.
1—2-hp. motor belted direct to
  1 38-in. band saw,
  1 small jig saw.
1—1-hp. motor, belted direct to
  2 double-spindle boring machines.
1—5-hp. motor, belted to line shafting to run
  1 24-in. planer,
  1 freight elevator,
  1 small boring machine.
1—5-hp. motor, belted direct to
  1 16-in. jointer,
  1 24-in. blower.
1—2-hp. motor, belted direct to
  1 12-in. jointer.
1—3-hp. motor, belted direct to
  1 rip saw.
1—3-hp. motor, belted direct to
  1 No. 20 Porter swing cut-off saw.
1—3-hp. motor, belted direct to
  1 Schimmel & Ried belt sander.
1—2-hp. motor, belted direct to
  2 Schimmel & Ried belt sanders.
1—3-hp. motor, belted to counter shaft to drive
  1 No. 1 Ransom swing cut-off saw,
  1 Beach rip saw.

Heavy Damage Due to Malicious Breaking of Street-Lighting Globes.

In a public statement Commissioner of Gas and Electricity William G. Keith, of Chicago, is calling the attention of school authorities, parents and the community in general to the heavy damage inflicted on the city's street-lighting system, due to malicious breaking of globes and even lamps on the street lights. Mr. Keith says that every globe costs about $3 to replace and if the 600-watt Mazda street lamp also is broken the cost amounts to $8. At the present time something like $30,000 a year is required for replacing broken globes and lamps. This sum would permit the city to maintain 8000 lamps on nearly 100 miles of streets, if this damage could be eliminated. A special appeal is therefore being made to school principals, the organization of Boy Scouts, parents and others to meet this problem, which it is believed will be effective.

This matter came to a head due exceptional damage on the recent Hallowe'en, which made it timely to call attention to a heavy and needless loss falling on the city. The aim is not to deprive boys of merry-making, but to direct their mirth into harmless channels.

Effect of Increased Costs on Central-Station Rates

A Compilation of Statistics by a Committee of the Southeastern Section Showing How Increased Costs of Fuel, Labor and Material Have Increased Cost of Serving Wholesale Power Customers

THE central-station industry has brought its efficiency constantly higher year by year for the past twenty-five years. Beginning with direct-current generators driven by high-speed engines it has progressed until at present we see the central power plants containing turbogenerators of 10,000, 20,000 and even 30,000 kilowatts capacity. Because of the rapidly increasing efficiency due to the development of the steam turbine and its accessories the price of fuel has not been the main governing factor of the production cost. So long as coal did not increase greatly in price any higher cost per ton of fuel has been more than compensated for by decreases in the pounds of coal burned per kilowatt-hour delivered at the switchboard. This increased efficiency in generating equipment coupled with higher load-factors, evenly loaded distribution systems and more consistent arrangement of distribution lines has allowed for continuous decreases in the rates for energy, despite the gradual small increase in fuel costs.

A point has now been reached, however, where these factors that allowed for decreased cost of service and, therefore, lower rates can pay little or no part in the future. No important increases in efficiency of prime movers or electrical generators can be expected in the near future and, therefore, any important factors of cost of production that vary must have a great influence on the production cost of power and the success of the utilities themselves.

Due to existing conditions caused by the great war, upon which it is unnecessary to elaborate, it appears that we have for at least the entire period of the war conditions about as follow:

(1) No new capital available for extension and additions to property.

(2) A condition of great industrial activity and consequent demands for additional service.

(3) An unprecedented shortage of fuel, labor and supplies, and consequently an abnormally high price for those actually available.

These are a combination of circumstances that are difficult for a public utility to cope with and ways and means must be devised to hold down their demands for labor and capital; above all some way must be found to increase revenue without making material increases in investment.

In the case of hydroelectric companies the price of coal, of course, does not have a great deal to do with the production cost of power except where the systems are a combination of water and steam-power plants. To treat on each class of company would complicate the facts so we will confine our discussion to plants generating electric energy wholly by steam. We will not make any reference to lighting rates since

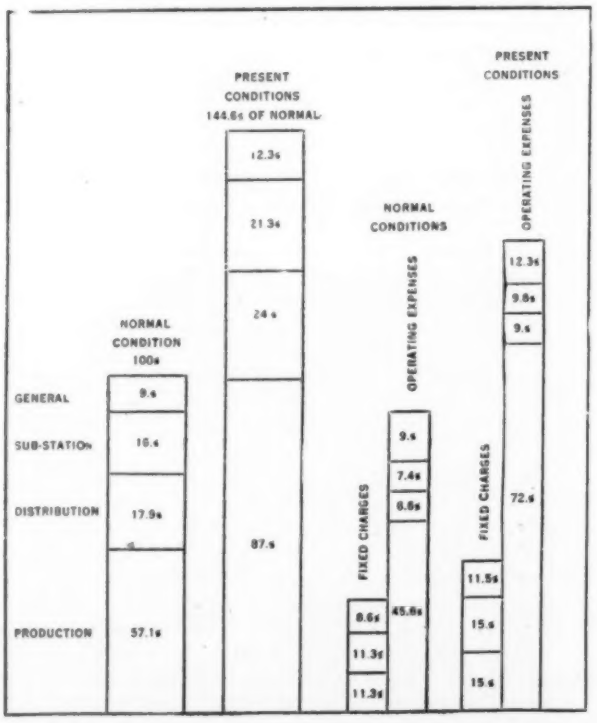


Fig. 1.—Comparison of Components of Cost of Service From a 5000-Kilowatt Steam Plant.

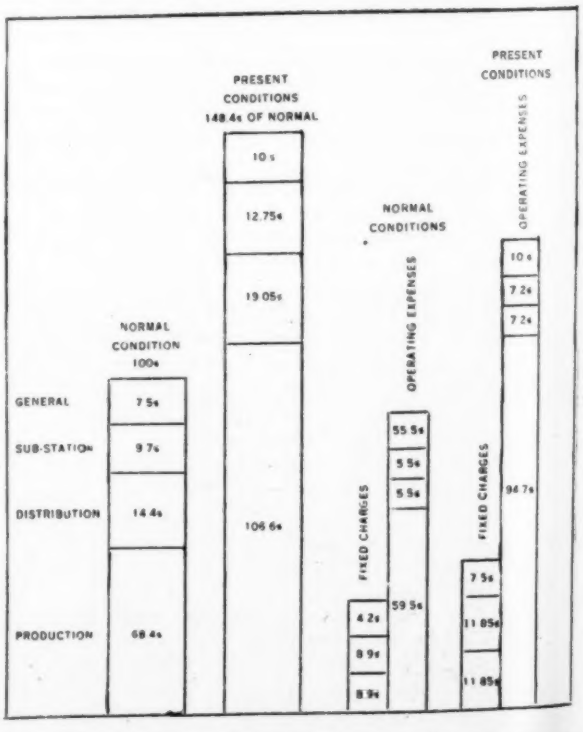


Fig. 2.—Comparison of Components of Cost of Service From a 20,000-Kilowatt Steam Plant.

the main cost to serve a lighting customer is not the production cost of power, but is made up to a great extent—in a large community—of other expenses such as general and commercial, transmission and distribution, insurance and taxes, depreciation and interest on bonded debt. The rate for the sale of wholesale power confronts us with an entirely different problem. Whereas the operating production cost of the energy used might be only about 15 per cent of the gross revenue derived from lighting it will average from 33⅓ per cent to 60 per cent of the gross revenue derived from the average central-station large power users. Since, therefore, we will deal only with power consumers we will discuss as examples two assumed cases of power companies operating over fairly large territories and selling to wholesale users only.

There are classes of consumers, whose use of electricity differs materially from that of the average user, and the problem of determining the component elements that go to make up the total cost of service is rather complex, requiring special analysis in each case. However, it is an easy matter to see that the primary elements entering into the cost of service are the prices of fuel, labor and material. Even a slight variation in any one of these elements will cause an appreciable increase in the manufacturing costs, and a corresponding decrease in net earnings of a power company

The relative cost of service to the average consumer may be divided into several factors, namely; production, distribution, substation, and general expense, and each of these items are in themselves component factors of the operating and fixed charges, which together constitute the total cost of service.

Operating and Manufacturing Costs.

Under the head of operating and manufacturing costs naturally fall fuel, labor, repairs and supplies, while fixed charges or investment costs include fair profit, interest, taxes, depreciation and obsolescence.

To illustrate the proportional increase of the cost of electric service, due to advances in price of the primary elements we show a 5000-kilowatt and a 20,000-kilowatt steam plant and transmission system operating with typical load-factors under present and normal conditions, and serving only wholesale power consumers.

It must not be assumed that the figures presented in the following tables are guaranteed for all steam plants of this nature, for we might easily find a number of plants where there would be variations in the percentages of cost; there are several potent factors that exert a direct influence on the items that constitute the total cost of service, namely; location, efficiency of machinery, character and diversity of load, etc.

From statistics compiled on a number of plants of similar capacities it was found that the average price of coal delivered in normal times was $3.00 per ton, and at the present time $5.00 per ton, an increase of approximately 66⅔ per cent, while labor has increased on an average of 33⅓ per cent. The average coal consumption per kilowatt-hour for a 5000-kilowatt plant was 2.8 pounds and a 20,000-kilowatt plant 2.5 pounds. Using these figures as a basis the total cost of service to the average consumer has been proportioned into its several component parts as follows:

For a 5000-kilowatt steam plant and transmission system with a 50-per-cent load-factor generating 22,000,000 kilowatt-hours per year under normal prices, Table I shows that operating charges amount to 68.8 per cent of the total costs while the remaining 31.2 per cent is apportioned to fixed charges. Taking this total cost under normal prices as a basis of 100 per cent, we see from Tables II and III and Fig. 1 that the present prices of fuel, labor and material operating charges have increased the total production cost 34.3 per cent, and fixed charges 10.3 per cent making the total increased cost 44.6 per cent.

For a 20,000-kilowatt plant and transmission system, with a 75-per-cent load-factor, generating 131,400,000 kilowatt-hours per year during normal times, Table IV shows that operating charges represent 78 per cent of the total cost and fixed charges 22 per cent. Again taking the total cost at normal prices as a basis of 100 per cent Tables V and VI and Fig. 2 show that operating expenses have been increased by 41.1 per cent, fixed charges gone up 7.25 per cent and that the total increased cost is 48.4 per cent.

Further calculations on the above tables develop the fact that the cost of fuel represents 35 per cent

TABLE I.

Cost of Electric Service Assuming a 5,000-K. W. Steam Driven Central Station and Transmission System.
(Normal conditions, coal at $3 per ton.)

GENERAL DATA:			
Capacity, 5,000 K. W.			
Load-factor, 50 per cent.			
K. W. H. generated per year, 21,900,000.			
INITIAL COSTS:			
Plant	$250,000		
Lines	250,000		
Substations	200,000		
Total	$700,000		
OPERATING EXPENSES:	Cents Per K. W. H.	Dollars.	Per cent of Total.
Plant—			
Fuel	.42		
Labor	.10		
Oil, waste and maintenance	.02		
Repairs and maintenance	.02		
	.56	$122,640	45.8
Distribution System—			
Patrolmen and maintenance	.08	17,520	6.6
Substations—			
Operator and maintenance	.09	19,710	7.4
General—			
Office, etc.	.11	24,090	9.0
Total	.84	$183,960	68.8
FIXED CHARGES:			
Plant	.139	30,441	11.3
Distribution system	.139	30,441	11.3
Substation	.105	22,995	8.6
Total	.383	$ 83,877	31.2
Grand total	1.223	267,837	100.0

TABLE II.

Cost of Electric Service Assuming a 5,000-K. W. Steam Driven Central Station and Transmission System.
(Present conditions, coal at $5 per ton.)

INITIAL COSTS:			
Plant	$330,000		
Lines	330,000		
Substations	270,000		
Total	$930,000		
OPERATING EXPENSES:	Cents Per K. W. H.	Dollars.	Per cent of Total.
Plant—			
Fuel	.67		
Labor	.15		
Oil, waste and supplies	.03		
Repairs and maintenance	.03		
	.88	$192,720	49.6
Distribution System—			
Patrolmen and maintenance	.11	20,090	6.2
Substations—			
Operators and maintenance	.12	26,280	6.8
General—			
Office, etc.	.15	32,850	8.5
Total	1.26	$275,940	71.1
FIXED CHARGES:			
Plant	.185	40,515	10.5
Distribution system	.185	40,515	10.5
Sub-station	.140	30,660	7.9
Total	.51	$111,690	28.9
Grand total	1.77	387,630	100.0

to 40 per cent of the total manufacturing costs at normal prices and 40 per cent to 60 per cent at present prices. Labor and material are also variable quantities and an increase in either item will produce a proportional increase in the cost of production.

As before stated, in the past public utilities have been able to reduce the cost of electric service, even though these items were constantly increasing, because of the fact that capital was being employed more efficiently and consequently electric energy was produced more economically. At the present time, with the continued upward trend of prices of everything that enters into the cost of production, the final limit has been reached and the consumer must recognize the fact that he can no longer pay for electric service at a fixed rate when the component elements that enter into the cost of service are variable quantities, subject to abnormal increases.

It is not the purpose here to try to name a specific cure for the ills that threaten the industry. Different conditions exist in different localities. The problem is being met when possible by the addition of a coal clause to the standard contracts. This does not allow for increases due to higher costs of labor and other materials than fuel but the utilities will probably have to absorb these increases in some other way. The problem is one that must be handled separately by the individual companies. Each station has its own coal cost per kilowatt-hour, which is as a rule an ascertainable figure, on which to base the actual rise in cost of energy furnished for every fluctuation in the price of fuel. The main point about working out a practical rate is not to attempt too complicated a sliding scale. Some companies have a simple rider stating that for certain increases in fuel cost the rate per kilowatt-hour should increase a certain amount.

Coal Clause Added by Counties Gas & Electric Company, Philadelphia, Pa.

The above secondary charge is based on the cost of coal to the company of steaming qualities satisfactory to the company and of heating value of thirteen thousand five hundred (13,500) B. T. U. per pound delivered on the railroad siding at the company's Norristown generating system at a maximum of three dollars and thirty cents ($3.30) and a minimum of two dollars and eighty-five cents ($2.85) per gross ton, which cost is equivalent to a maximum of one dollar ($1.00) and a minimum of eighty-six cents ($0.86) for 9,163,600 B. T. U. on the siding.

Should the actual average cost of such coal to the company delivered as aforesaid during any three consecutive months be greater than the maximum or less than the minimum costs given above, then for each three per centum (3 per cent) increase or decrease in said maximum and minimum cost respectively the secondary charge will be increased or decreased by fourteen thousandths of a cent (.14c) per kilowatt-hour on all consumption in excess of the first thousand (1000) kilowatt-hours in the next succeeding month.

Coal Clause Added by Muncie Electric Light Company.

For each 5c increase in the average monthly cost of coal above $1.90 per ton, F. O. B., cars on the power plant switch track of the Muncie Electric Light Company, Muncie, Ind., there will be added each month to all net bills based on power schedules to which this schedule is supplementary 15/100 of a mill per kilowatt-hour.

For each 5c decrease in the average monthly cost of coal below $1.35 per ton, F. O. B., cars on the power plant switch track of the Muncie Electric Light Company, Muncie, Ind., there will be deducted from all net bills based on power schedules to which this sched-

TABLE IV.

Cost of Electric Service Assuming a 20,000 K. W. Steam Driven Central Station and Transmission System.

(Normal conditions, coal @ $3.00 per ton).

GENERAL DATA:			
Capacity, 20,000 K. W.			
Load Factor, 75 per cent.			
K. W. H. generated per year, 131,400,000.			
INITIAL COSTS:			
Plants	$ 800,000		
Lines	800,000		
Substations	400,000		
Total	$2,000,000		
OPERATING EXPENSES:	Cents Per K. W. H.	Dollars.	Per cent of Total.
Plant—			
Fuel	.375		
Labor	.080		
Oil, waste and supplies	.015		
Repairs and maintenance	.015		
	.485	$637,290	59.5
Distribution System—			
Patrolmen and maintenance	.042	55,188	5.5
Substation—			
Operators and maintenance	.042	55,188	5.5
General—			
Office, etc.	.61	80,154	7.5
Total	.630	$827,820	78.0
FIXED CHARGES:			
Plant	.073	95,922	8.9
Distribution system	.073	95,922	8.9
Substation	.037	48,618	4.2
Total	.183	$240,462	22.0
Grand total	.813	$1,068,282	100.0

TABLE V.

Cost of Electric Service Assuming a 20,000-K. W. Steam Driven Central Station and Transmission System.

(Present conditions, coal @ $5.00 per ton.)

INITIAL COSTS:			
Plant	$1,060,000		
Lines	1,060,000		
Substations	530,000		
Total	$2,650,000		
OPERATING EXPENSES:	Cents Per K. W. H.	Dollars.	Per cent of Total.
Plant—			
Fuel	.596		
Labor	.128		
Oil, waste and supplies	.024		
Repairs and maintenance	.024		
	.772	$1,014,408	63.9
Distribution System—			
Patrolmen and maintenance	.056	73,584	4.6
Substation—			
Operators and maintenance	.056	73,584	4.6
General—			
Office, etc.	.081	106,434	6.9
Total	.965	$1,268,010	80.0
FIXED CHARGES:			
Plant	.097	127,458	8.0
Distribution system	.097	127,458	8.0
Substation	.048	63,072	4.0
Total	.242	$317,988	20.0
Grand Total	1.207	$1,585,998	100.0

TABLE III.

Table Showing Percentage Increase in the Component Factors of Cost of Service From a 5,000-K. W. Steam Plant and Transmission System.

	(Operating Ex. per K. W. H.)			(Fixed Charges per K. W. H.)			(Total per K. W. H.)		
Classification:	Normal.	Present.	Increase Per cent (of total).	Normal.	Present.	Increase Per cent (of total).	Normal.	Present.	Increase Per cent (of total).
Production	.56	.88	26.2	.139	.185	3.7	.699	1.065	29.9
Distribution	.08	.11	2.4	.139	.185	3.7	.219	.295	6.1
Substation	.09	.12	2.4	.105	.140	2.9	.195	.260	5.3
General	.11	.15	3.3	....	....	...	....	.15	3.3
Total	.84	1.26	34.3	.383	.510	10.3	1.223	1.770	44.6

TABLE VI.

Table Showing Percentage Increase in the Component Factors of Cost of Service From a 20,000-K. W. Steam Plant and Transmission System.

	(Operating Ex. per K. W. H.)			(Fixed Charges per K. W. H.)			(Total per K. W. H.)		
Classification:	Normal.	Present.	Increase Per cent (of total).	Normal.	Present.	Increase Per cent (of total).	Normal.	Present.	Increase Per cent (of total).
Production	.485	.772	35.2	.073	.097	2.95	.558	.869	38.20
Distribution	.042	.056	1.7	.073	.097	2.95	.115	.153	4.65
Substation	.042	.056	1.7	.037	.048	1.35	.079	.104	3.05
General	.061	.081	2.5	....	....	....	.061	.081	2.50
Total	.630	.965	41.1	.183	.242	7.5	813	1.207	48.4

ule is supplementary 15/100 of a mill per kilowatt-hour.

COAL CLAUSE ADDED BY THE CLEVELAND ELECTRIC ILLUMINATING COMPANY.

If, after November, 1917, the average price of coal per ton (with 10 per cent added but addition not over 20c) during any period of 24 consecutive calendar months, exceeds $2.25, the railway shall pay, in addition, a number of dollars ascertained by dividing by 1000 the number of kilowatt-hours drawn during such two-year period, and by multiplying this quotient by the difference between such "average price" of coal and $2.25. If such "average price" of coal is less than $1.75, then the company shall refund a number of dollars ascertained in the same manner, but based on $1.75 per ton.

COAL CLAUSE ADDED BY RHODE ISLAND COMPANIES.

The Blackstone Valley Gas & Electric Company, Pawtucket, R. I., has filed with the Rhode Island Public Utilities Commission new tariffs for power and off-peak loads on both Pawtucket and Woonsocket divisions. These contain the following coal clause:

The above rate is based on an average cost to the company of $4.00 a gross ton for Pocahontas or New River coal or other coal of equivalent grade, (a coal containing approximately 14,800 B. T. U. a dry pound), or a proportional average cost for coal of other heating value, delivered into Pawtucket storage of the company.

The total cost of the coal used by the company for the generation of electricity in Pawtucket in each calendar month shall be determined on the basis of the cost delivered in the company's Pawtucket storage of all coal held in the Pawtucket storage of the company on the first day of such month, and if this total cost varies from such average, the aggregate amount of the variation shall be divided by the total number of the kilowatt-hours of electricity delivered by the company in such month for power purposes and to other public utilities, and the variation per kilowatt-hour for such month so determined shall be added or deducted as the case may be to or from the charge per kilowatt-hour for all electricity delivered in such month under this rate, and such variation shall not be subject to any discount.

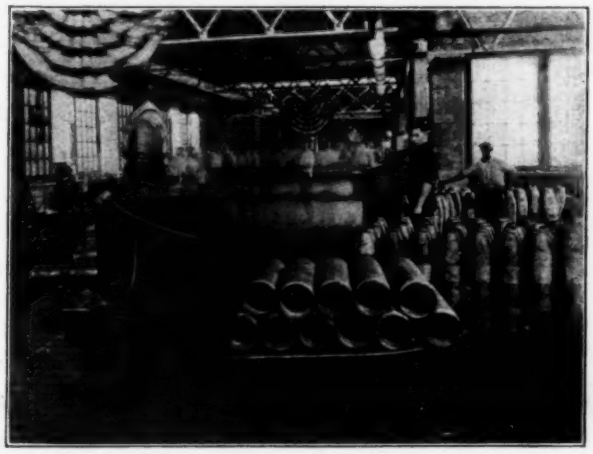
Electric Industrial Trucks Release Men for Service.

After a comprehensive study of short-haul transportation conditions the electric industrial truck has been found to most satisfactorily meet the requirements in nearly every kind of industry. The average person probably has but a very slight conception of the tremendous amount of work which is handled by these small electric trucks in factories, and at railroad terminals and piers.

It has been estimated that over 1,000,000,000 tons of freight are handled yearly in the United States, and although there has been an unusual accumulation due to increased exports, and therefore considerable congestion at freight terminals and piers during the last three years, the electric truck has aided materially in systematically handling this mass of material. Statistics prove that the electric industrial truck can replace from three to five men, who are thus released for meeting unusual demands for men—and more men, and these economic units also show an increase in the handling speed.

New uses for the industrial truck are constantly being found. Several years ago the Government adopted them for use in our arsenals, and following England's precedent, practically all of the factories making munitions are now using these "electrics," and are finding them indispensable.

As the demand has been created, varied types of these trucks have been placed on the market. They



Electrical Industrial Truck in a Munition Factory.

are made small enough to operate in the aisles of factories and storage warehouses, to run on elevators and into freight cars, yet their standard capacity is two tons. Many of these carry loads up to 20,000 pounds, and they can climb grades too steep for hand trucks. Elevating transfer trucks have also been developed which can pick up, carry away and set down loaded interchangeable platforms, thus eliminating the hand labor in loading and unloading the trucks.

A prominent gasoline automobile company has a fleet of 49 electric industrial trucks, and in its plant which covers about 110 acres of floor space the average hauls are 150 feet, and these little trucks successfully pull loads up 12 per cent grades. Their entire fleet is housed in an 80 by 80-foot garage. Operating record of a 2-ton truck was kept during one month, and the average cost per ton-mile follows:

Labor	$2.040
Power	.066
Maintenance	.010
Investment and depreciation	.017
Average total cost per ton-mile	$2.133

This truck averaged 3.7 miles per day loaded, plus the same mileage empty, and its average daily total tonnage was 14.1.

Electric Power Back of the New Italian Lines

Two Interesting Plants for Furnishing Hydroelectric Power for Italian Arsenals—Unique Features of the Isola Development, Which Operates Under a Head of 3050 Feet

By C. A. TUPPER

BACK of the new lines of the Italian army on the Livenza, Piave and Adige Rivers lies a great arsenal and supply district centering at Milan which is served with electric power; and among the most interesting of the plants furnishing that power is one commonly known as the Adamello development.

Electric current is generated in two stations, at Isola and Cedegolo; but before describing these it will be desirable to review the construction of the hydraulic system from which the power originates. This was inspected by the writer before the outbreak of war and there has been no change since that time. In it will be found many valuable features of comparison with similar opportunities existing on the American continents.

Towards the northern end of the high, snow-capped Adamello Mountains, the principal flow of water from glaciers and mountain springs is into the River Oglio, a tributary of the celebrated Po. The Oglio is fed from the River Poglia, which, in turn, derives its flow mainly from the streams known as the Salarno and the Poja d'Arno, the latter joining the main branch of the Poglia at the village of Isola. The Poja d'Arno rises in the Lago d'Arno, a lake completely surrounded by steep mountain slopes at 5872 feet above sea level.

The engineers planning this development decided to begin by utilizing the flow obtainable from the Lago d'Arno at Isola; and again at Cedegolo to utilize it in the River Oglio reinforced by the flow of the Poglia and the Salarno, the waters of the latter being carried in a conduit to Isola. From Isola the combined flow from the Poglia, from Lago d'Arno and from the Salarno is conveyed to Cedegolo through a conduit, tunnel and pipe line.

In this article will be outlined the development at Isola, followed by a later description of the plant at Cedegolo. The drainage area available for the latter is about 37 square miles and the annual rainfall is so heavy that a natural discharge of about 78.6 cubic feet per second can be safely relied upon for the Cedegolo plant situated at 1333 feet above sea level.

Drainage and Storage for Isola Plant.

The drainage area of the Lago d'Arno is limited to about 5.4 square miles; but the lake has great depth and therefore impounds a very large volume of water. To develop the available power, the lake has been tapped at 82 feet below its normal level, corresponding to elevation 5872 feet.

At this elevation the surface area of the lake is about 6,185,000 square feet, and at elevation 5789 feet it is still about 3,927,000 square feet; hence a useful volume of nearly 472,000,000 cubic feet is available. An annual rainfall of 39.4 inches would be sufficient to make up this volume, but the records which were taken over a period of years proved the average fall to be considerably greater. Measurements of the discharge have further shown that about 11 cubic feet per second flow out of the lake even in winter during the periods of least water. This led to the belief that considerable quantities of spring water, partly from other drainage areas, must find their way into the lake throughout the winter months.

With these conditions, it was assumed to be possible to draw off a constant volume of 71 cubic feet per second for 7 to 8 hours daily throughout the 300 working days of the year, and to develop thereby an output of at least 19,000 horsepower. Since the Adamello stations are intended mainly to supply the arsenal districts with power for peak loads and to act as a reserve plant during periods of low water, it is evident that such a natural storage reservoir serves a most useful purpose.

The lake level can readily, and with very small outlay, be dammed up another 65.6 feet, thereby increasing the useful storage volume to 1,060,000,000 cubic feet. This more than doubles the former capacity of the lake.

The additional water required to make use of this greater storage capacity is being obtained by deflecting the upper portion of the Poglia River (or Adame, as it is called above Isola), which with the necessary elevation at the proposed intake drains an area of about 8.1 square miles. The conduit and tunnel required have a total length of nearly 3.7 miles. It was also decided that a further fall of about 656 feet could be utilized from the upper Poglia development by the construction of a turbine plant on the shore of the Lago d'Arno, since this is the difference in elevation between the point where the new tunnel emerges from the mountain, above the lake, and the level of the lake itself. With this third station the total fall utilized on the Poglia will be in round figures the sum of 1540, 3050 and 660 feet, or 5250 feet.

In order to provide for the possibility that the level of the lake might be lowered to the level of the intake tunnel at elevation 5789 feet, by a large consumption of water during a severe winter like that of 1916-17 with a heavy and prolonged demand for power before the commencement of the spring thaws, the company arranged to raise the water level by a further 26 feet and thus increase the useful storage by nearly 106,000,000 cubic feet, by means of a floating pumping plant. Apart from the fact that the power available in the winter is thereby still further increased, which, of course, will be of very great importance to the Italian arsenal plants and affects the capacity of the system in no small degree, it has also been possible by means of this pumping plant to lay all the intake works and the tunnel dry for inspection or possible repairs when needed.

Intake Tunnel and Penstocks.

From the level at which the water of the Lago d'Arno is drawn off to the turbine inlets at Isola, there is a fall of 2985 feet. In tapping the lake, a short adit was driven in the side of the cliff towards Isola, and a shaft sunk to the level determined upon for the intake. Thence a circular tunnel was extended horizontally in both directions, first to the point where the penstock begins and then to the lake, the latter section being completed after a sluice gate had been constructed. This gate is set in a frame 63 inches square, having the same area as the tunnel. The intake level is at elevation 5872 feet, and the height of lake level normally at 5954 feet, so that the gate had to be built to withstand a high pressure head.

At the discharge end of the tunnel, 295 feet before its junction with the penstock, a vertical shaft was cut through to the surface of the mountain slope above, 230 feet, so as to serve as a standpipe for taking up the pressure surges. It has a diameter of 23 feet. Both this and the sluice gate were planned with a view to the utilization of the higher lake level made possible by the dam.

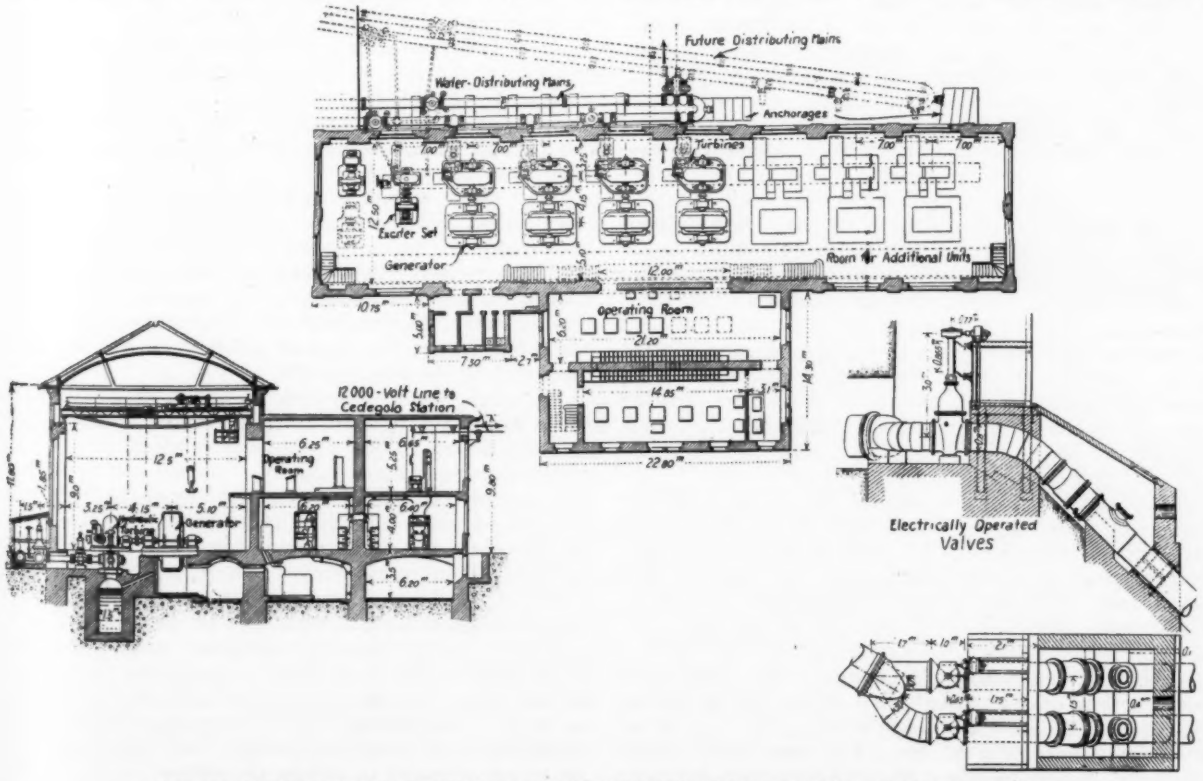
In planning the construction of the penstock lines to the Isola power house, the greatest care had to be exercised in order to avoid any considerable loss of head and, at the same time, to keep the water velocities in the pipes within a minimum to withstand the high pressure of over 1320 pounds per square inch.

The question of utilizing this great head in two stages was therefore proposed and seemed all the more tempting in that the mountain slope provided a level spot exactly in the middle of the fall, where ample space could be found for a power station. The pipe line itself would then have been much cheaper, besides being within the required conditions of pressure, etc., which had already proved eminently satisfactory in the operation of other stations, both in Europe and America. The construction and running charges of the whole plant with two central stations would have been, on the other hand, considerably heavier; and a balancing reservoir would be necessary with such an arrangement to receive the water from the turbines of the upper station. A well known plant similar to this had already been constructed in Italy on Mont Cenis, with a total fall of 2920 feet, used in two stages.

The constructing engineers determined, however to utilize the fall in one step, in spite of the relatively large volume of water and the very high velocity necessary in the pipes, and they were influenced in their decision to no small extent by the excellent character of the Lago d'Arno water, which the writer can testify is as clear as crystal and makes any settling unnecessary. Such a condition is important, since the wear of turbine parts in contact with water at this pressure carrying even a very slight percentage of suspended matter increases very nearly as the square of the velocity and might lead to serious interruptions of service.

On the one hand, in order to keep the water section of a pipe line as large as possible and thus to reduce to the lowest limits the loss of head which increases as the square of the velocity and, on the other hand, to avoid too great a thickness of pipe and difficulty in the joints, it is often advisable to use a single pipe down to a certain pipe thickness, and then to divide by means of a breeches pipe, the two lines having together the same cross section as the single pipe. This arrangement was carefully worked out at Isola but was abandoned, principally on account of the difficulty in making the breeches pipe and from the necessity of providing this with stop valves.

It was therefore decided to lay two separate and parallel pipe lines from the penstock chamber to the Isola power house. As the works are enlarged further pipes can be laid. Each line is only intended to deliver 35.3 cubic feet per second; this gives a velocity



Plan and Cross-Sectional Elevation of Isola Hydroelectric Plant and Detail of Penstock Piping.

of only 66 feet per second in the largest pipes of 31.5 inches diameter, and about 13.2 feet per second as the greatest normal velocity in the smallest pipes of 22 inches diameter near the power house. The conditions existing represent a loss in head of about 79 feet, or approximately 2.6 per cent. The thickness of the lowest pipes, which have to stand a static pressure of 3050 feet, reaches 1.26 inches, which it has been found possible to weld satisfactorily in pipe by the autogenous processes.

The pipe line is divided by eight anchorages into seven inclined parts, to which must be added the horizontal distributing pipes along the power house. The pipe line passes through several tunnels. Two separate tunnels are provided for the two pairs of pipes, and cross levels a little over 19.6 feet wide have been broken through the dividing walls at intervals of 66 feet for delivering the pipes of the second pair of lines from the trolley way when these additional lines are finally erected. The line of the pipe bed was chosen with a view to covering in the pipes with earth to a depth of 6.6 feet after the starting up of the works. This was necessary to prevent freezing of the water in the pipes, since the station is often under load for only eight hours of the day, and it is naturally impossible, from the very character of the works, to allow water to flow for the remaining 16 or more hours, during which the plant is idle.

The top section of the pipe line, down to the point where the static head reaches about 722 feet, consists of riveted pipes of 31.5 inches diameter, and 0.28 to 0.55 inches thickness. They were made in 19.7-foot lengths, and the circular joints riveted together on the site. For the lower portions of the line, pipes of the same length lap-welded by the oxy-acetylene process were used. These pipes were connected by overlapped double-riveted sleeve joints capable of withstanding a pressure head of 1870 feet. A final part of the line down to the power house was provided with flange joints. These were provided with a welded-on flange end with a recess containing a wedge-shaped groove to receive round rubber packing. The two ends are pressed together by loose flange rings. Before carrying out the work, the engineers in charge repeatedly tested one of the pipes with this flange joint to a pressure of 4000 pounds, that is to say, about three times the working pressure, with satisfactory results.

The pipe material used was the best open-hearth fire-box steel plate, having a tensile strength of 46,000 to 51,000 pounds per square inch and 30 per cent average elongation. This plate gave a high quality coefficient of 65 to 70, whereas the accepted standard abroad for such boiler plate is 62. All pipes were kept at test pressure for one hour, during which the weld joint was thoroughly hammered. Any pipe showing signs of sweating was rejected. The effective length of each section of pipe had to be limited to 14 feet on account of the great difficulties of transport.

The sluice valves are electrically driven and are controlled from the power house; the motors switch off automatically when the end position is reached. Expansion joints, with stuffing-box packing, are used below each anchorage in the usual manner.

Water-Distributing Mains at Power House.

Especial care had to be taken in the design and construction of the distributing mains to the power house. Both pipe lines are laid alongside each other as far as the middle of the power-house wall, where they are joined together by a semicircular bend, so that the lower turbines are fed from the second pipe line around this bend. It will be seen from the plan and section of the Isola station that sluice valves are arranged in such a way as to enable either pipe line to be closed at any time and the turbines to be fed from the other. These valves are hydraulically operated.

The flange bolts of the horizontal pipes near the power house have to withstand a remarkable stress, since the hydrostatic pressure acting on the cross section of the two pipes produces a tension of not less than 280 tons. A partial relief was provided for these joints, without interfering with their longitudinal motion during contraction and expansion, by having a hydraulic piston acting on the semicircular bend from the last masonry foundation block at the end of the pipeline. The cylinder behind the plunger is always in connection with the pressure pipes, and thus carries a pressure of 3050 feet head to oppose the load on the flange joints. The resulting relief amounts to about 61 tons. The semicircular bends and the spherical T-pieces which connect to the turbines are steel castings. Third and the fourth pipe lines can be arranged in a similar way and connected to the second and first. Upon completion of the erection, each pipe line was filled with water and tested by pumps to one and one-half times working pressure, when they were found to be perfectly rigid and water-tight.

Specially Designed Hydraulic Turbines.

From the distributing main the water flows to each turbine through a pipe of 13.8 inches diameter, to which is connected a hydraulically operated sluice valve of especially heavy construction. The water then passes through a bend to a needle nozzle of circular cross section, from which it emerges as a cylindrical jet on the wheel. A pear-shaped needle which is movable along the axis of the nozzle regulates the area of the opening and the quantity of water required for the load on the turbine. The whole inlet bend carrying the needle nozzle is movable about the axis of the inlet pipe, in which it is pivoted. By swinging the nozzle in the vertical plane, it is possible to adjust the direction of the jet so that it hits the buckets accurately at one end of its swing but at the other misses the runner entirely and shoots straight down into the tailrace.

The Isola station is laid out for seven main turbine units, each rated at 6000 horsepower for 420 revolutions per minute, together with an exciter set of 500 horsepower. Whatever has been said about the difficulties of construction of the pipe line owing to the high pressure, or about the importance of ensuring the smallest possible loss of head in it, applies with greater force to the turbines.

A single jet was chosen as the most suitable for these units, on account of the greater simplicity of the inlet pipes. The jet diameter is about 3.15 inches and it has a spouting velocity from the nozzle of 443 feet per second. It is evident that even the very best materials can resist such a jet as this only if the latter impinges on the buckets without shock, and is deflected by them in a perfectly smooth and steady curve. Especial care was, therefore, necessary to safeguard the parts against rapid wear and to insure a high efficiency. The question of regulation also had to receive close attention, so that no great rise of pressure should occur (on sudden variations of generator load) in a pipe line already highly stressed under normal conditions, and that there should be at the same time no waste of water to reduce the output of the station.

It would have been an easy matter with this high

fall to have built a wheel having high speed and consequently small dimensions and light weight. But the necessity in this case of providing for commercial efficiency required a wheel of large size; hence the comparatively slow speed of 420 revolutions per minute was selected. The runner was therefore given an outside diameter of about 9.9 feet and the very favorable ratio between wheel diameter and size of jet of 80:3000 = 2:75 resulted. It was also possible to fix a pitch for the buckets which ensured a uniform deflection of the water jet.

In order to obtain a large flywheel effect for the group, and therefore small moving velocities of the regulating mechanism, the turbine runner itself was built as a flywheel with a heavy rim. Although a rather longer time of closing was thus made possible, viz: 5 to 6 seconds, yet this would be much too brief to prevent serious rises in pressure in the pipe line; so to avoid this the deflecting nozzle, above described, was chosen in preference to other devices, such as a jet deflector or an auxiliary outlet pressure regulator, owing to the greater wear which the use of these would occasion. Similar practice has obtained on the Pacific Coast of this country and in the Andes in South America.

As it was considered very important to be able, at times, to put heavy overloads on the turbines and yet obtain the highest possible efficiency at all loads, a series of tests was carried out at the Isola station, for loads beginning at 200 horsepower and rising to 7200. At 2000 horsepower the efficiency approximated 80 per cent, and steadily increased to a maximum of 88 per cent at 5500 horsepower. Furthermore, the efficiency fell only slightly at the overload capacity of 7200 horsepower, and with this output the turbines were not even completely open, so that each unit could be economically operated with 7200 horsepower as the maximum normal load, instead of at the rated capacity of 6000 horsepower.

Electric Generators.

Each of the main turbines is direct-connected to a three-phase, 40-cycle, 12,000-volt generator. Current is delivered at that terminal pressure to transformers at the Cedegolo station, where it is raised to 60,000 volts for transmission to the arsenal districts. The electrical arrangement of the plant is, therefore, very simple. The only auxiliary of importance is a rotary-converter set of 500 horsepower which serves as a reserve for the exciter unit.

The power house, which has interior dimensions of 207 by 41 feet, lies close against the mountain slope, and on the right bank of the Poja d'Arno, the natural outflow from the Lago d'Arno. The tailrace passes under the turbines, its outlet being at right angles, about in the middle of the power house, beneath the distributing pipes; it then turns to the right and widens to form a measuring channel and overflowing weir. A junction is effected, immediately below this weir, with the conduit which carries the water from the Poglia (Adame) and Salarno Rivers to the Cedegolo station. A description of the latter and brief mention of the power transmission system will be printed later.

Development of its water powers has been literally the salvation of Italy in the present war. Without it the acute shortage of coal would have compelled a cessation of activity in the manufacture of munitions and army supplies. In this, therefore, is a lesson which Americans should not fail to heed, especially in the present critical times.

ELECTRICITY PROMOTES ECONOMY IN STREET REFUSE DISPOSAL.

New York City's Modern Motorized Street-Cleaning and Refuse-Haulage Equipment.

To gather, remove and dispose of the street dirt, ashes, garbage and miscellaneous refuse of a large city is a very important problem. In the largest city of our country it has been attacked with considerable success. In recent years the use of motorized equipment by the Department of Street Cleaning of the City of New York has resulted in important economies, a brief account of which should prove of interest. We are indebted to J. T. Fetherston, commissioner, and Joseph R. Buchanan, secretary of this department for the photographs and data of this up-to-date street-cleaning motor equipment.

The first step taken in rehabilitating what is known as the Model District was to devise plans and apparatus operated by motor power to displace the horse-drawn vehicles and cleaning by hand, so far as practicable. After thoroughly investigating and testing all available apparatus supposedly suitable to the purposes in view, and finding none entirely satisfactory, the engineering division of the department undertook the task of designing the principal pieces of apparatus required for the economical working out of the newly devised methods. A gasoline-electric tractor was designed by the department's engineering division and after construction and trial was found to meet the requirements. At first, twelve of these tractors were completed and made ready for service, as a cost of $4166 each.

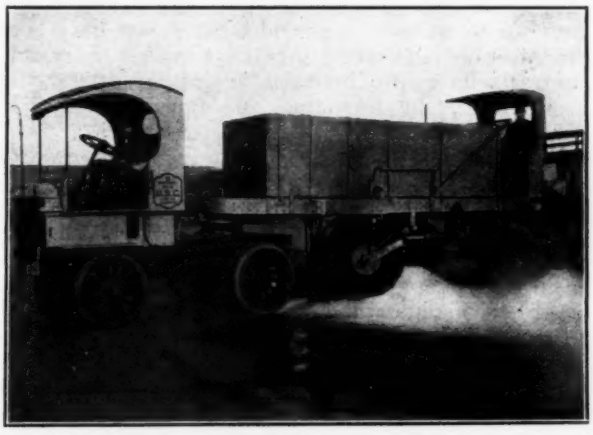


Fig. 1.—Combination Street-Flushing and Scrubbing Machine Used by Department of Street Cleaning, New York City, Operated by Electric Power from Gasoline-Electric Tractor in Front.

Trailers, to be drawn by the tractors, and combining facilities for collecting in separate compartments ashes, street sweepings, garbage and rubbish, were also designed and constructed. These trailers provide for the collection of the four classes of material on the same trip, whereas the old horse-drawn car requires three distinct trips for the task. In addition to this apparent economy, each trailer carries an amount of waste material equal to eight car loads. Eleven of the trailers were constructed at a cost of $810 each.

Later, seven additional tractors and six trailers were added to the Model District equipment, and two tractors were transferred to Brooklyn and one to

the Bronx, leaving 16 tractors and 18 trailers for Model District service. Further motorization of the Model District equipment was accomplished by the installation of a combination flusher-sweeper, which was also designed by the department's engineering division. This machine, as its name indicates, flushes and sweeps the street pavement in one operation, thus not only enhancing the quality of those branches of the service, but doing so economically. Three more of these combination machines were then provided for use when weather conditions would permit of flushing. Other equipment in the Model District has been made to conform to the motorized collection methods, for instance installation of locomotive cranes for transferring trailer loads to scows, and advancing all contingent apparatus and methods to the higher plane.

Approximately $68,000 was saved to the city by this modern equipment in 1916, as compared with 1914, the last year in which horses exclusively were used for collection in the district. It was found desirable to motorize other districts as the Model District fulfilled the promises made for it by the head of this department and new motorized apparatus is rapidly being introduced to great advantage.

The nuisance occasioned by uncovered carts used in transporting ashes and garbage, which had for a long time been a source of complaint from citizens, was abated to a considerable extent. By employing savings made from the maintenance appropriation, the department was able to provide covers for 400 of the carts the first year and later the policy of providing covers for carts was continued, until now it may be said that practically all carts used in the collection of ashes or garbage are covered. Covered department cans for street sweepings and other refuse have been placed in districts where they were badly needed, and contracts have also been let to further extend this improvement, by providing, in Manhattan, at first, for a full complement of covered street cans.

The most far-reaching feature in the program of equipment improvement was embodied in the plans for the Model District. In the belief that the time had arrived when the Department of Street Cleaning of the great city should discard its antiquated equipment and adopt modern, up-to-date machinery, the Board of Estimate and Apportionment was asked to provide the funds with which a beginning could be made. The sum of $250,000 was appropriated for this purpose and District No. 6, Manhattan, was selected as the field in which to work out the new plans of the department. Believing this district with its modern equipment would be accepted as a model to be copied in other, and eventually in all, of the districts, the head of the department christened it the "Model District."

The extension of street flushing has been a cardinal feature of the administration's program, until practically every street is flushed. The hose gangs were increased and the area flushed and washed was extended until, in the summer and fall months, practically every street in Manhattan, and most of the important or congested thoroughfares in Brooklyn and the Bronx, were cared for by hose, squeegees, or sprinkling carts and machine sweepers, at least once in every 24 hours.

During the summer and fall of 1916, when infantile paralysis was so prevalent, extra precautions were taken in every direction and the pavements in the congested sections were flushed frequently, in some instances two or three times during a day and especial attention was given to those streets in which there were pushcart markets. The combination flusher and sweeper, shown in Fig. 1, greatly facilitates the work of street washing and was constructed under department designs.

Notwithstanding the policy of substituting motor equipment for horse-drawn apparatus as rapidly as the assent of the Board of Estimate could be obtained and funds procured, no pains have been spared in caring for the department's remaining horses. Better stabling has been provided by remodeling and by the addition of new stables. An important feature of the new stable is its garbage relay system, which has resulted in a saving of three miles haul per cart of the type shown in Fig. 2. It has also made it possible to give better service in the Flatbush section. Tours formerly covering two collections a week are now giving three collections weekly, and where there were three weekly collections a daily service is now given. A considerable saving in men, horses and money has been accomplished by the installation of a garbage relay station in the eastern section of Brooklyn.

It is stated that there has been a steady increase in the amount of refuse collected and disposed of by the Department, keeping pace with the growth of the city. In 1913 the number of cart-loads of ashes, garbage and rubbish collected was 3,646,941. In 1916 the number was 3,808,765. Each inhabitant is responsible for approximately 1500 pounds of waste per annum.

Fig. 2.—Gasoline-Electric Tractor in Use Relaying Garbage, Collected in Carts.

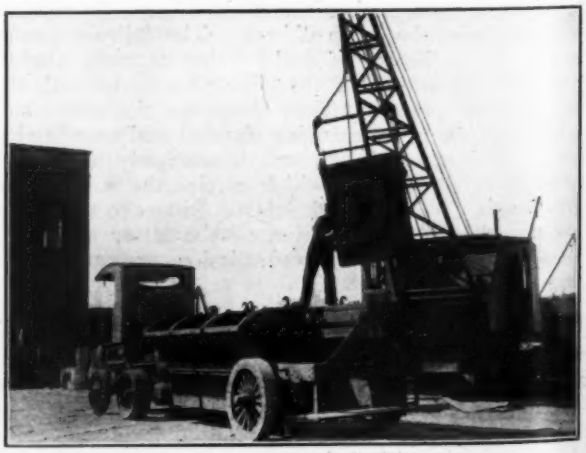


Fig. 3.—Electric Crane Unloading Refuse Compartments from Truck to Scow.

Editorial Comment

Copper Prices

The War Industries Board is reported as taking the position that the copper trade should consider 23.5 cents as the maximum price of copper until January 31, 1918; and that all contracts in the meantime made for the sale of copper to be delivered after that date should be made subject to the price to be fixed by the Government for the subsequent period.

A request for a ruling as to whether dealers may buy copper at 23.5 cents and re-sell at a figure above that seems to have brought no response from the Government. The larger consumers may, of course, arrange to buy the metal direct from the producers, but there are hundreds of consumers whose purchases are necessarily made in comparatively small lots, and who are accustomed to buying through dealers. Absolute Government control, with Government selling agencies, seems possible. But even the Government cannot take over, house and distribute copper free of cost.

Financing Hydroelectric Projects

THE utilization of water power for generating electrical energy is an engineering problem as regards the physical aspect of the project, but underlying this is the essential financial problem. The financing of such enterprises is usually accomplished by the issuance and sale of bonds, based upon a developed and equipped project as security. Such financing is accomplished, in most cases, through the service of bond houses whose functions are to secure funds for the capitalization of worthy enterprises, and thereby to provide safe channels for the investment of the funds of their clients. They buy such utility bonds and resell them to investors in many of the walks of life. They are intermediaries, rather than speculators, and they buy and sell on a comparatively close margin. The investor relies on the advice of the bond house as to the element of safety in the securities offered. The responsibility thus assumed makes it necessary for the bond house to investigate and pass upon every phase of a project bearing upon its prospective commercial success.

This leads directly to the proposition of financing and developing hydroelectric projects on streams within the public domain, and the outstanding fact in relation thereto is that neither bond houses nor others commanding capital will undertake to do so, because under existing laws Government permits to effect such development are made revocable at the discretion of the Secretary of Interior if on non-navigable streams, and at that of the Secretary of War if on navigable waters, and because there is no provision for remuneration for the investment made, in case of such revocation.

The purposes of the Walsh bill now pending in Congress, relating to non-navigable streams, and the Shields bill, relating to the navigable waters, are to remove these barriers to the development of our water-power resources. Those who demand only certainty of title and reasonable safety of investment should not be held at bay by laws that perpetuate waste and conserve nothing.

The Coal and Railroad Situation

THE admitted shortage of coal for power-plant operation is serious enough to demonstrate the need of more efficient transportation from mines to boiler-room bins, which implies better railroad equipment and higher standards of service. In the opinion of the carriers, developments of the last few months furnish clear evidence of the necessity of an increase in rates with which to meet these conditions.

The continued and severe decline in the soundest of railroad stocks has caused deep concern not only to the carriers and the investing public but to men of affairs generally. This decline is the result not of business depression, but of the high and mounting cost of materials needed by the railroads in their operation as well as of labor. Though gross earnings have increased, net earnings have been falling off alarmingly.

Extraordinary demands are being made upon the railroads by the government, by the basic industries of the country, including the electric central stations, and by trade and commerce generally. All of these must be properly met, for congestion and delays are detrimental to the nation. It will be recalled that a few months ago the carriers of the whole country united in an application for a 15 per cent advance in freight rates, and that the Interstate Commerce Commission, after a protracted series of hearings, denied the request except in the case of the New England roads, which obtained a measure of relief. However, the Commission then explicitly stated that it stood ready to amplify or modify its order and grant more general advances in freight rates should later developments establish the necessity of this action. In reopening the case for a rate advance, as has recently been done, the Commission properly may consider not merely the actual facts and figures submitted by the railroads, but the effect of small or vanishing profits

on the credit of the carriers and therefore on their ability to borrow money and maintain or enhance the efficiency of their service. The issue is one so closely bound up with industry as a whole that it cannot be ignored. It should and must be promptly met.

National Shipping—More Electrical Orders

AN EVENT of great importance to the electrical industries from the standpoint of future supplies of new equipment, maintenance and repairs is the nationalization of American shipping which took effect in the closing days of October. At that time all cargo vessels of more than 2500 tons dead weight and all passenger vessels of more than 2500 tons gross, of American registry, were requisitioned by the United States Government and will, at least for the duration of the war, be operated as a national merchant marine. Furthermore, the equipment of each ship, including electrical apparatus, will be brought up to the highest practicable efficiency.

As soon as the organization and operation of these ships is running smoothly it is expected that the limit will be lowered and that all ships of from 1500 to 2500 tons will be added to the Government fleet. The tonnage involved in the initial requisition exceeds 2,000,000 tons. Ship owners are outspoken in their approval of the Government's course.

After most successful trials, the first of the standard merchant steamers built in the United States has been put into commission. The keel was laid in February and the hull was launched in June. It will be followed by hundreds of other standard vessels. It is understood that six types of cargo steamers, known as A, B, C, D, E and F, are at present being constructed, of about 8000 tons dead weight, 7000 tons, 5000 tons and 3000 tons dead weight, and the designing of other types is under way.

In the thirty-eight months that have elapsed since the beginning of the world war, new shipping and shipbuilding companies have been organized in the United States and Canada with a total authorized capitalization of nearly half a billion dollars. In practically all cases these are equipped with electrically operated plants. Steps are being taken by the American wooden shipbuilding interests of the Pacific Coast to protect their industry. Efforts center chiefly in seeking a permanent organization of the Pacific Wood Shipbuilders' Association, which includes firms in Washington, California and Oregon.

Government orders in British Columbia shipyards, additional to the American contracts previously listed in the ELECTRICAL REVIEW, call for vessels (wood) 280 feet long, 44 feet beam and gross tonnage of 2800. At Vancouver are building six steel steamers, 425 feet long with breadth of 54 feet and of a dead-weight tonnage of 8800. These are the only steel vessels under order in western Canada and the largest vessels thus far constructed in the Dominion.

What the Goodwin Plan Means to the Industry

IT is natural that a movement of such wide scope as that launched by W. L. Goodwin, at the recent convention of the National Electrical Contractors' Association, which has as its object the reorganization of practically an entire industry, should meet with some opposition and criticism. There has, however, been very little adverse sentiment expressed to the ideas voiced by Mr. Goodwin, indicating strongly the need for adherence to fundamental merchandising principals in the electrical industry.

Some opinions regarding the Goodwin plan have recently been brought to light, which are obviously based on either a misunderstanding of the underlying facts, or insufficient data regarding the plan of reorganization and co-operation proposed by Mr. Goodwin. It has been stated for instance that insofar as electrical contractors are concerned it is a sound proposition, but there are other sides to the electrical industry to be considered. To route all retail sales through the contractor is not altogether to the liking of the central station, the jobber, or the manufacturer.

It is obvious that a statement such as this could originate only because all of the facts were lacking. As Mr. Goodwin himself stated, his plan is simply to bring together in harmonious action the various interests in the industry, so that there may be established retail distribution of electrical materials at fair prices to the consumer and a fair profit to all parties taking part in the transaction. In other words, the Goodwin plan does not discourage the retailing in electrical merchandise by manufacturers, jobbers or central stations, but urges that where a retail department is maintained by these interests, it should be conducted entirely separate from the business of manufacturing, jobbing or the generation of electricity, and made to bear its own costs. This would not only standardize electrical merchandising, but would remove a great deal of unfair competition, which the electrical contractor and dealer must now face and it would certainly tend to stabilize conditions in the industry.

Many jobbers and central stations who operate a retail department conduct these departments at a loss, because they feel it is incumbent on them to foster a wider use of electrical appliances. Others who are charging a considerable portion of their overhead to other departments do not realize that they are doing business without profit and at the same time demoralizing the industry. The electrical contractor and dealer is the legitimate retail distributor but if, as is true in some instances, he is not alive to his opportunities, it does not follow that the central station and jobber should enter this field on a basis that will discourage the fullest electrical development.

It is to remedy such conditions that the Goodwin plan was proposed and it is very gratifying that it has met with such universal approval.

HAPPENINGS IN THE INDUSTRY

Electric Railways Form War Board—Convention of Southeastern Section—Meeting of Engineering Council—New Park Lighting in Chicago—Miscellaneous News

ELECTRIC RAILWAYS FORM WAR BOARD.

Organize Co-operatively to Facilitate Handling of Troops, Military Supplies and Other Government Traffic.

Electric railroads have joined the steam roads in the movement to assist the Government as a unit in war transportation. The large trolley-road mileage, especially in the states east of Chicago, will be used as is that of the steam lines, and it is expected to be a large factor in moving government freight as well as troops. A board appointed by the American Electric Railway Association recently includes Britton I Budd of Chicago, president Northwestern Elevated Railroad Company and the Chicago, North Shore & Milwaukee Railway Company; Arthur W. Brady, president Union Traction Company of Indiana; L. S. Storrs, New Haven, president the Connecticut Company; Thomas N. McCarty, Newark, president Public Service Company of New Jersey; P. H. Gadsen, Charleston, S. C., president Charleston Consolidated Railway & Lighting Company.

The war board will place every facility of the electric railway industry at the service of the Government. The board will be organized on lines similar to those of the war board of the steam railroads, will have headquarters in Washington and will work in close co-operation with the Council of National Defense.

CONVENTION OF THE SOUTHEASTERN SECTION, N. E. L. A.

Effect of War on Utility Operation Discussed at Annual Meeting at Birmingham.

Many topics of timely interest, dealing mainly with war conditions, were discussed at the annual convention of the Southeastern Section, National Electric Light Association, at Birmingham, Ala., October 24, 25, 26, and 27. The convention was opened by an address of welcome, delivered by Rev. H. M. Edmonds, pastor of the Independent Presbyterian Church, Birmingham, followed by an address of the president, W. E. Mitchell of the Alabama Power Company.

Mr. Mitchell laid stress in his address on the need for concerted action by the people in reference to future water-power development, in order to conserve the coal supply which at the present time is rather acute. The hope was expressed that at the coming session of Congress, some legislative enactment be passed, allowing better development of the water powers of the South.

The first paper on the program was by W. H. Onken, Jr., on "The Central-Station Industry in War Time." There was considerable discussion by the members in reference to the effect of coal shortage on the existing contracts.

The next paper was read by G. K. Selden of the Safety First Committee, American Telephone & Telegraph Company, Atlanta, Ga., entitled, "Safety." This paper brought forth considerable discussion in reference to the safety appliances used by the different utility companies in their work on high-tention lines.

Next on the program was a talk by Harry Strong on the methods of handling customers' accounts. Mr. Strong, who is assistant auditor of the Birmingham Railway, Light & Power Company, Birmingham, Ala., described the methods used by his company from the time the contract was obtained until the final collection was made on the bill presented to the customer.

The meeting adjourned at this point to witness a Liberty Loan parade, staged by the people of Birmingham. The members of the Association together with their guests were invited to occupy review stand seats.

Following the intermission a paper was read by P. A. Tillery, assistant general manager of the Carolina Light & Power Company, Raleigh, N. C., entitled, "A Few Comments on the National Electrical Safety Code and Its Trial Use."

The meeting opened on morning of October 25 with the report of the Rate Committee, by D. H. Cronheim, chairman, sales manager of the Alabama Power Company, Birmingham, Ala. This dealt with the effect of increased costs of fuel, labor and material on the cost of service to wholesale power customers.

After this report, talk was made by H. W. Alexander of the Society for Electrical Development, New York, N. Y., on the subject of "Selling the Electrical Idea." Mr. Alexander viewed this subject from the standpoint of the consumer and not the company.

The next paper was read by A. B. Patterson of New Orleans for Carl T. Naumberg of the Henry L. Doherty Company, New York, N. Y., the title of the paper being, "Selling Securities to the Consumer." Mr. Naumberg was unable to read his paper himself, due to the fact that he had been called to active service as First Lieutenant in the Ordnance Section of the Officers' Reserve Corps.

The next paper presented was by M. C. Rypinski of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., on the subject of "Historical Development of the Induction Watt-Hour Meter." This paper was illustrated by lantern slides.

The last paper was presented by L. W. Carnagy of the General Electric Company, Atlanta, Ga., on the subject of "Some Notes on the Standardization of Transformers and the Economic Results Obtained by the Installation of Potential Regulators."

At the executive meeting held the following officers were elected for the ensuing year:

H. A. Orr, president, Anderson, S. C.

H. H. Carr, first vice-president, Raleigh, N. C.

George H. Wygant, second vice-president, Tampa, Fla.

Executive Committee—C. D. Flanigen, Athens, Ga.; L. L. Newman, Birmingham, Ala.; F. H. Knox, Spartanburg, S. C.; F. H. Plummer, Asheville, N. C.

On the evening of October 25 the members and the guests of the Association were guests of the Birmingham Railway, Light & Power Company at a banquet, held at the Tutweiler Hotel.

On Friday, October 26, the Association was the guests of the Alabama Power Company on a trip to its 25,000-kilowatt reserve steam plant, located on the Warrior River and at the mouth of the coal mines. This trip was made by special train and special boat. After an inspection of this steam plant the Association was tendered a barbecue by the Alabama Power Company.

On October 27 the members made a trip to Lock Twelve, the big 75,000-kilowatt hydroelectric development of the Alabama Power Company, at which time an inspection was made of this developement.

One very striking feature of this convention was the note of patriotism which was in evidence in the discussion of all subjects and all speeches made at the different entertainments.

MEETING OF ENGINEERING COUNCIL.

Laws to Promote Hydroelectric Development Approved—Other Business Considered.

The Engineering Council met on October 11 in the rooms of the American Society of Mechanical Engineers, Engineering Societies Building, New York.

The Rules Committee submitted a draft of rules for the admission of other societies to the Council and progress was made in their consideration.

The Committee on Public Affairs reported on a number of requests that the Council support pending or proposed legislation.

Remedial laws intended to promote hydroelectric development were favored and the Council voted to offer its co-operation to the United States Chamber of Commerce which is interesting itself in this matter.

A movement to co-ordinate, unify and strengthen the work of various engineering committees co-operating with the federal authorities at Washington was favorably considered. H. W. Buck and Charles Whiting Baker were appointed Council conferees.

Platinum Tests Not Being Made for U. S. Geological Survey.

United States Geological Survey, through its Press Bulletin for November, refers to current reports to the effect that Platinum Metals Company, Philadelphia, has been making tests of platinum-bearing material for the United States Government, and states that, while the Geological Survey is studying platinum deposits of the United States, no material supposed to contain platinum has been sent to Platinum Metals Company for testing. It is further announced that the Geological Survey has made no investigation of the so-called "amagnite process" for saving platinum, although it has received a few samples of the so-called "amagnite" from that company. In conclusion, this bulletin says:

Among the advertising matter issued by this company is a copy of a letter addressed to the Geological Survey specialist on platinum by the company itself. Of course any statements made in such a letter carry absolutely no endorsement by a Government official, even if this impression may be given to some readers.

NEW PARK AND BOULEVARD LIGHTING IN CHICAGO.

Single and Two-Light Ornamental Lantern Units for Grant Park and Michigan Boulevard.

A notable installation of ornamental park and boulevard lighting has recently been completed on the South Park System in Chicago. It includes single and double-light lantern units in Grant Park, Chicago's well known central lake-front park, and two-light lantern units on the five miles of Michigan Boulevard between Twelfth Street and Garfield Boulevard (55th Street). The accompanying illustrations show the two types of ornamental posts used.

The single-light units have a total height of 13 feet 11 inches above the curb; the light center is 12 feet 1 inch above curb. The lanterns are octagonal with eight rippled-glass panels. The full height of the lanterns is about 32 inches. A fluted column with ornamental capital and an intermediate decorated band is used. The base is 20 inches square. A locked door in the latter gives access to a one-to-one series transformer which serves to protect the lamp from high voltage and to maintain (in case a lamp burns out) the continuity of the 7.5-ampere series circuit supplying this lighting system.

Ornamental Single-Light Standards in Grant Park.

In the case of the two-light lantern units the column proper, to a height of 10 feet 6 inches, is identically the same as the single-light units. The lanterns likewise are identical. They are supported by an ornamental two-arm bracket and braced near the top by a T-extension of the stem. The height to the light center is 12 feet 3 inches, and the over-all height is 14 feet 2 inches. All the ornamental iron standards were furnished by the George Cutter Company, South Bend, Ind.

Along the five miles of Michigan Boulevard the new installation consists of 315 double-lantern units arranged 63 on a circuit of just one mile each. At each street intersection there are four standards placed

Ornamental Double-Light Standards in Grant Park. Art Institute in Background.

one on each corner. In the interior of each block there are four standards as a rule; these are now staggered or alternated, but provision has been made so that four more units can be added later within each block opposite those now installed, thus making a uniform arrangement of opposing units throughout the five miles. In each lantern of the boulevard units is a 160-watt, 250-candlepower Mazda C lamp. The new units replace arc lamps and some series tungsten units that were formerly mounted on cast-iron posts that had been in service about 25 years or more. The

Ornamental Double-Light Standard on Michigan Boulevard.

old underground cables were practically all found suitable for further use.

In Grant Park the new lamps displace a considerable number of gas lamps and also provide lighting for portions of the park paths and areas not heretofore illuminated. There have been installed here 40 double-lantern units, corresponding exactly to those just described, and 21 single-lantern units each containing a 400-candlepower Mazda C lamp. The single units are placed for the most part along the less important paths.

Tests are being made with different types of glass for the lantern panels and with reflectors and refractors for the lamps to still further improve the lighting effect.

Needed for the Army.

The Quartermaster Enlisted Reserve Corps, with recruiting headquarters at 357 Broadway, New York, has received a new authorization to enlist men to follow their civilian trades in the army, for duty in this country, and abroad. The men particularly needed at this time include electricians, tinsmiths, iron workers, merchanics and blacksmiths. Enlistment is open to citizens of the United States, or to those men who have declared their intentions of becoming citizens. They must be between the ages of 18 and 45 years and have no one depending on them for support.

The Electric Canoe.

Electric canoes are becoming very popular on the Upper Thames River, states a recent issue of the English publication Motor Ship & Motor Boat. The first electric canoe was launched in June, 1908, and has been followed by other designs, each showing an advance over its predecessor. These canoes are constructed with additional strength to provide for the extra weight of the motor, which is placed amidships together with the storage battery, leaving ample room forward and aft for passengers. Some of the canoes provide comfortable accommodations for eight passengers, and others provide for only four. The most modern electrics have steering wheels operating a three-bladed propeller through a pinion and a ratchet. A 30-cell battery is commonly used, which has a capacity for one day's run.

The electric canoe has many advantages over the gasoline-driven launch, as it is silent, free from vibration, and does not travel at a speed that causes any appreciable wash. Many boat builders on the Thames have installed charging equipment, and the electric canoe has already proved so popular that it bids fair to bring about a revolution in mechanically propelled craft on many rivers, dependant only on adequate charging facilities.

Skilled Men Desired in Gas and Flame Service.—Expert mechanics and chemists are needed in the Gas and Flame Service of Army engineers. An urgent appeal for men skilled in these lines is sent out by the commanding officer of the Thirtieth Engineers, Washington, D. C., to mobilize for the formation of a Gas and Flame Service Regiment. Recruiting is in progress by volunteering, and the regiment is to be ready to go to the front by the last of November. It is required in the American offensive and to be in the thick of the fight. Skilled men are needed to assume positions of responsibility. Chemists and research men are especially desired. Col. A. A. Fries, now in France, is an officer of the Corps of Engineers, and is to be commanding officer of the Thirtieth Engineers. Pay of privates in this service is $33 per month and expenses. Higher pay is given those assigned to special duties and to those who become officers.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

NOT NECESSARY TO PLACE ELECTRIC RANGES ON TRIAL.

Care Should Be Taken in Deciding On First Customers in a Campaign.

By Frank J. Allen.

Range Specialist, Westinghouse Electric & Manufacturing Company.

The idea that in order to carry an electric-range campaign to a successful conclusion, it is necessary to place the ranges out on trial, is to my mind absolutely erroneous. This opinion is based on the successful outcome of a series of campaigns which I have conducted during the past six months.

It is the exception that a range placed on trial will remain. Just why, it is difficult to ascertain, but I believe it is due largely to the psychological effect of giving people—and especially women—the opportunity to change their minds. Then the class of people who insist on trial installations are usually lacking in stability of purpose.

The installation of an electric range in a home means some effort and rearrangement of affairs on the part of the housewife and often in trial installations there is not sufficient character in the housewife to carry her over this short period. Very often before the advantages of electric cooking are fully realized, she has seen some new furs or furniture. Not being, as she sees it, financially nor morally obligated, she lets Dame Fashion get the best of her, and gets the furs instead of the range. People of this class are not of the right caliber to become the first range owners in a community.

Indeed great care must be exercised in deciding who shall be permitted to buy the first range in a community, for much depends thereon.

The ideal home for the first installation is that of a progressive woman of good social standing, who does her own work and appreciates appliances which enable her to economize. A woman of such type invariably knows of electric cooking, and being of a progressive turn of mind is receptive to the proposition. Once being convinced, this woman is not of the type that makes purchases on trial.

In a town of 6000 population, in which I conducted a campaign on the Westinghouse electric range, in addition to giving four lectures and cooking demonstrations, I sold and secured written orders for 36 ranges, without putting out a single one on trial.

In another town of 60,000, where, for over two years, the central station had been trying to sell ranges and had installed three on trial, during the first month in addition to planning and giving several lectures and cooking demonstrations, I secured written orders for 15 ranges and during the second month 21 ranges, none of which were "on trial." Automobiles are not sold on trial and if you properly explain, demonstrate and produce results, there is no reason why an electric range should be sold on trial. If people want to see results let them be shown in the display room of the central station by a competent demonstrator, where not only the few interested, but as well the passing public can witness the results.

A METER-READING FORM THAT INSURES ACCURACY.

Rockford Company Adopts System That Insures Against Error on Part of Readers.

Although it is not uncommon to hear complaints that meter readers guess at the monthly meter readings from the records of the previous consumption of a customer, there is as a matter of fact very little ground for such accusations. However, there is an

NAME
ADDRESS
LOCATION OF METER
IDENTIFICATION NUMBER 69282

ACCOUNT NUMBER				METER NUMBER	CONSTANT	CARD NO.	ROUTE NO.
	NO.	DAY	YR.	IDENTIFICATION NUMBER	READING	READ BY	
12				69282			
11				69282			
10				69282			
9				69282			
8				69282			
7				69282			
6				69282			
5				69282			
4				69282			
3				69282			
2				69282			
1				69282			

Meter-Reading Card of Rockford Electric Company.

opportunity for such practice on the part of an unscrupulous or lazy employee and it was to guard against this that the Rockford Electric Company, Rockford, Ill., adopted the meter-reading form shown

in the accompanying illustration. While the idea of withholding figures on previous readings from meter readers is not original with the Rockford company, the form which it has adopted has numerous advantages over many now in use.

Each meter reader is provided with loose-leaf route book containing a form, such as the one illustrated, for each customer. As will be noted the sheet is divided into 12 tabs, one for each month. Each tab is numbered with the meter number. When a reading is made the figures are entered on the tab for the corresponding month and each night when the books are turned in the day's readings are detached. One advantage of the detachable tabs is that it makes it possible to easily see which meters were not read.

Since the adoption of this system there have been practically no complaints and the work of the billing department has been considerably simplified.

Remote-Controlled City Water-Pumping Station to Reduce Maximum Demand.

The City of Fort Atkinson, Wis., through its Water and Light Commission, after pumping the city supply of water with steam for many years, recently changed its plant over to electric pumping and purchased energy from the transmission system of the Milwaukee central-station company at a low rate, which made it advantageous to do as much pumping as possible without increasing the peak load. The pumping plant put in about a year ago consisted of an American Wells Works four-inch, single-stage, double-suction centrifugal pump, directly driven by a 40-horsepower General Electric motor. This pump has a daily capacity of 1,000,000 gallons against the head of 175 feet when operating at a speed of 1750 revolutions per minute.

Fig. 1.—Service Transformers and Housing for Fort Atkinson Remote-Controlled Pumping Station.

Fig. 2.—Interior of Fort Atkinson Auxiliary Station, Showing Control Panel, Motor, Pump and Flow Meter.

Since the performance of this first unit was very satisfactory the commission decided to effect further power saving by installing another pump to relieve the peak load and deliver as much water into the mains at the lowest rate of flow possible, thus keeping down the maximum-demand charge and giving a better energy rate. A description of this new unit was given in a recent issue of Engineering and Contracting, which kindly furnished the accompanying illustrations. A flowing well is located about 4000 feet from the main pumping station, where the first electric pump was installed.

A small auxiliary pumping plant, shown in Fig. 1, was installed at this well. It consists of an American Wells Works 2.5-inch, horizontal, single-stage, double-suction, centrifugal pump, which is operated by a 20-horsepower, three-phase, 60-cycle, 220-volt, General Electric squirrel-cage induction motor. The pump is bronze-fitted completely and operates at a speed of 1800 revolutions per minute. The transmission between the main station and this auxiliary plant consists of a three-phase copper line, along which was added a single No. 10 iron wire to form part of the control circuit.

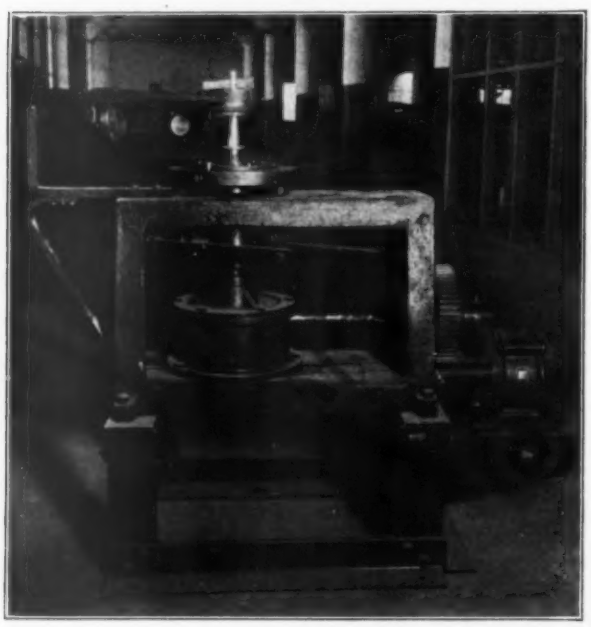
In the auxiliary plant (Fig. 2) is placed a Sundh Electric Company's control panel for operating the motor. At each end of the control line is a single-pole, double-throw knife switch, arranged so that the equipment can be operated from either end of the line, all that is required being throwing of the switch at either the main or auxiliary pumping station into the opposite position. This control, together with the method of priming the pump, is so perfect that the operator need not leave the main pumping station to operate the auxiliary plant so long as the knife switch on the control panel is in either one or the other position. By throwing the switch in the other direction from the one in which it was not operating, the pilot light glows, showing the pumping plant is now in operation, and so long as the lamp remains lighted he knows the plant is in service. Whenever the water in the elevated storage tank indicates that it is nearly full it is only necessary for the attendant to throw the switch in the opposite position to shut down the pumping plant.

The performance of this auxiliary plant was so satisfactory that during the first month of service it was not visited by the operator in the main station, it being only necessary for an oiler to fill the oil reservoirs three or four times a week. The substation at other times operated without attendance and was kept locked.

The auxiliary plant when in operation delivers an average of 310 gallons per minute against a total head of 180 feet at 1740 revolutions per minute with 22 kilowatts input indicated at the switchboard. A flow meter is attached to the discharge of the pump and this indicates that there is an over-all efficiency between the power charged to the pumping plant and the net amount of water pumped into the mains of practically 50 per cent. The cost of equipment for this pumping plant was very low, as it is very simple in design and the pump is a single-stage type.

Motor Used to Mount Tires on Automobile Wheels.

An electric motor is being used in the Maxwell Motor Company's new assembling plant at Kansas



Electric Motor-Driven Apparatus for Mounting Tires on Automobile Wheels.

City to revolve automobile wheels upon which the tires are being mounted. These wheels are usually revolved by hand in automobile factories. By the Maxwell method, a slow-speed motor is geared low to an upright axle. As the wheel is revolved, small rollers press on the tire. By this method, approximately 1500 tires can be mounted in one day.

Effect of Sale of Utility Securities to the Public.

Speaking before the recent convention of the Southeastern Section, N. E. L. A., Carl T. Naumburg, of Henry L. Doherty & Company, discussed the effect of selling stock to the public. "All companies," he said, "who have tried selling securities to their consumers agree that the attitude of even the non-purchasing public was more cordial, fair and evidenced more interest in the companies' affairs; that the corporation was looked upon as more 'live' and progressive. The obstructionists among public service corporations executives were forced to put away their crepe and admit their error.

"The success of public service companies in Denver, Baltimore, Minneapolis and many other cities has been based almost entirely on sales of stock, although in fairness to methods of bond financing it must be said that general business and investment conditions, when these security selling campaigns were under way, were overwhelmingly in favor of the larger yields afforded by high-grade stocks.

"In each case securities placed with consumers have not only in the majority of instances remained in the hands of the original purchasers, but a substantial portion of the buyers have from time to time increased their holding by subsequent purchases."

Brooklyn Company Makes Cash Sales of $5700 at Electrical Exposition.

The exhibition of the Brooklyn Edison Company at the recent Electrical Exposition, held at the Grand Central Palace, October 10 to 20, surpassed all previous exhibits of this company.

The main idea was to put on a merchandising show, every inch of space being utilized to push the sales of appliances, portable lamps and wiring.

Household appliances were attractively displayed in 27 niches along the rear wall. This feature received much favorable comment, as particular attention was focused on one article at a time, in contrast to a general display on a table or counter.

The new Edison store-wiring proposition was given a corner position and attracted considerable attention. The four fixtures were shown in individual booths with black backgrounds.

The Edison easy-payment house-wiring plan drew a large crowd, 10 contracts being signed at the show and 155 live leads secured, many of which have already been closed satisfactorily. Six black-lined

Exhibit of Brooklyn Edison Company at Which $5700 in Cash Sales Were Made.

booths were used for the display of the fixtures supplied on this plan.

A 10 per cent discount on all wiring contracts and purchases made at the Edison booths, induced a great many Brooklynites to attend the show and sales to the amount of approximately $5700 were made, beating last year's sales record by over $1000.

Electric Furnaces in Sheffield, England.—Sheffield, the principal steel city in England, was the place where electric furnaces for steel making were first erected in that country only a few years ago. Now there are in operation 38 electric furnaces in Sheffield, and 17 are being erected.

Notes on Operating Practice

A Department Devoted to Practical Problems of Plant and Operating Practice With Particular Reference to Electrical Generation and Distribution

SOOT REMOVAL FROM BOILER SURFACES.

A Statement of the Evils of Soot and a Comparison of Hand and Mechanical Methods for Its Removal.

By Lionel Linnell.

Many steam-making stations are today consuming coals obtained from localities other than those from which they have been accustomed to obtain their coal, because of embargoes, scarcity, strikes and congestion of railroads. The coals now used probably possess different properties than those used formerly, perhaps they contain higher percentages of ash and volatile matter. To get the best results from any coal the furnace, the grate and the boiler setting should be designed to suit it. This, obviously, is not feasible where the change of coals has been made suddenly and unexpectedly, nor is it desirable to do so where the change may and probably will be but transitory. Under these circumstances it is to be expected that more smoke and soot will occur, and more frequent cleaning of the boiler heating surfaces and the passages transversed by the furnace gases will be necessary. This is in fact the case, but unfortunately lack of apparatus for determining the condition of the heating surfaces allows soot and ash to insulate the heating surfaces, thus resulting in large waste of heat units, until cleaning is done because of inability to obtain the requisite draft or inability to make steam. It is little value to endeavor to obtain high combustion efficiencies, or a small increase in the efficiency of a turbine or generator and allow five per cent or more to be lost from the heat value of the coal, just because the boiler-heating surfaces and those of the economizer are allowed to become sooted up. Yet it is undoubtedly a fact that the use of different coals is at the present time causing needless loss of heat just because of such thoughtlessness.

The accumulation of soot, and those other products of combustion passing under the same name, invariably occurs eventually, even where combustion is supposed to be nearly perfect. It is merely a matter of time although of course the poorer the combustion the more rapid is the accumulation of soot. It is therefore the best policy to not only endeavor to maintain heating surfaces clean by cleaning them but also to devote attention to careful firing with this same end in view. This is particularly true of those stations now burning high-volatile coals because none other are available, and whose furnace chambers and boiler settings are not adapted to burning them.

It is the experience of the writer that the hand-fired furnace soots up its boiler more rapidly than the boiler mechanically stoked, probably for the reasons that the firing is less scientific, the coal being fed to the fire in large quantities periodically instead of in small quantities continually, because of the opening of the fire doors to throw in the coal and the inrush of cold air, and unequal thickness of fuel bed. The costliness of smoke is usually stated to be that just so much volatile matter passes up into the stack unburned, and thus is wasted. This is a true loss, but it occurs only so long as the smoke occurs, that is while the unburned volatile matter is passing away. But there is a more serious aspect to smoke, though less often mentioned. The passage of smoke through the boiler heating surfaces causes sooting. Sooting is cumulative in effect and may even persist until the passages between tubes are almost entirely clogged. This soot that adheres to the heating surfaces is a partial heat insulator which prevents the transfer of heat from

furnace gases to the boiler contents and thus lowers the boiler efficiency and the over-all economy of the unit. The soot thus formed by the smoke that came and passed away remains to lower the efficiency of the boiler until it is removed. From this viewpoint smoke is an expense indeed.

Soot, which is usually supposed to be a soft black substance like lamp black, may be soft and black, and then it may be composed of ash and clinker fused together and incrusted in the heating surfaces. The form the soot assumed depends very largely upon the coal, how it is burned and whether the boilers are operating at high or low evaporations. Forcing of boilers, that is to say high evaporation, tends to cause a form of soot at once more difficult to remove and one that should be removed as it is a hard gritty substance of high heat resistivity, upon which soot occurring when the boiler is no longer being forced adheres to form an extensive mass which may grow until the space intervening between the tubes is clogged, and the draft reduced accordingly.

Soot is objectionable, whether it is known to exist or not. The question then is whether soot and ash and clinker should be allowed to collect gradually until the mass has assumed such proportions as to necessitate cleaning or whether the soot shall be removed as it forms, or whether it shall be prevented. The question really becomes one of whether manual cleaning which is the old-time method shall be resorted to, or whether the modern method of mechanical cleaning shall be adopted. It is the writer's opinion that the day is coming if it has not possibly already arrived when mechanical cleaning will take the place of hand cleaning. There are several reasons for this. Firstly, mechanical cleaning is much more efficient, and this is important these days of high coal prices. It can be carried out much quicker, which means a boiler may be available for use in shorter time. The tendency of the times in all walks of life is to eliminate the human element wherever possible, using automatic methods. There is much to gain by eliminating the human element in cleaning boiler heating surfaces. The job is a dirty one, and depends upon the person doing it whether it is done properly or not. At best it is a thankless task with no one to follow and carefully scrutinize the work. It is a hot and tiring job, hence it is liable to be scamped. Then men doing the cleaning are usually poorly paid, and know little about the value of clean heating surfaces, and care less. The larger the boiler, the longer and greater the number of boiler tubes the more difficult is the task of cleaning, likewise the seriousness of sooty heating surfaces. Large boilers burning low-grade fuel are set up higher than the small boiler, which is another factor mitigating against hand cleaning for it is not an easy nor altogether safe practice to climb up ladders hauling after you a hot and heavy hose and nozzle with live steam. Another disadvantage of hand cleaning is that doors must be provided through which the cleaning may be done. If not properly closed after use these doors allow infiltration of air which lowers the temperature of the furnace gases, and wastes heat therefore.

Mechanical Soot Cleaning.

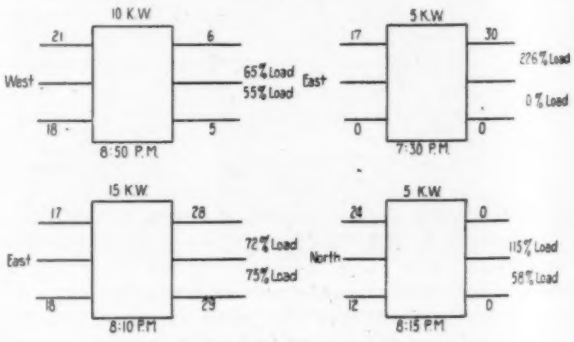
Mechanical cleaning can be done often whereas a thorough hand cleaning is done seldom. Mechanical cleaning thus removes the soot and ash while there is little of it whereas hand cleaning is carried out only after there is a real accumulation. Mechanical cleaning gives the best over-all efficiency, since the average temperature of the flue gases will be lower because the average heat transfer from furnace gases to boiler contents will be higher therefore. Whereas a hand-cleaned boiler may be cleaned once every 24 hours and even less often, one that is cleaned mechanically may be cleaned four or more times, thus increasing the average efficiency and reducing the lost heat that passes up the stack unutilized.

The use of high-pressure steam or compressed air as is used for hand cleaning is not free from risk, is slow and as already pointed out has no assurance of thoroughness. On the other hand mechanical cleaning is reliable, since independent of the human element when once installed; it is rapid in action since all surfaces are cleaned at one time instead of separately, making the boiler available for service within a very short time. In fact the mechanical cleaner can be used where load conditions prevent hand cleaning.

Mechanical cleaning appartus is rather expensive, the cost varying from about 3 to 10 per cent of the cost of the boiler, and it is the comparatively high initial cost that prevents the use of mechanical soot-cleaning apparatus on a larger scale. However, at the present time the high cost of coal makes the use of the mechanical soot cleaner appear a very sound investment. Effort is being made to make the boiler room a cleaner, more comfortable place for boiler-room attendants, and the mechanical cleaners work toward this end. The attention that is now centered upon fuel economy and the conservation of coal tends to encourage a higher grade of labor in the boiler room, a grade of labor that will demand a higher compensation and render better results. These factors all work for the elimination of dirty inefficient work, and encourage the mechanical soot cleaners, the mechanical stoker and ash removers, etc., thus overcoming the shortage of suitable labor.

Transformer Testing Outfit.

A convenient transformer-testing outfit in use by the Portland (Ore.) Railway, Light & Power Company consists of a split-type current transformer with



Typical Tests Made on Transformers.

two windings connected to a low-reading ammeter with a 40-foot duplex stage cord.

Two scales, one for each winding, were calibrated with standard instruments. The low scale has a range of from 5 to 45 amperes and the high scale from 45 to 150 amperes. A two-point dial switch mounted on the side of the current transformer is used for changing scales. The contacting bar on this switch touches one button before leaving the other, so that in changing scales the circuit is not opened.

All testing is done on the secondary side of the transformers, generally in the outside legs only, and

in each direction from the transformer. In this way the total load on the transformer is obtained. The condition of balance between the two sides of the line is shown and also how nearly the transformer is located to its center of load.

In using this outfit it is, of course, necessary to test at night when the peak load is on. We found that during the winter months we could test over a period of three hours, and still be very close to the peak.

Two men and a Ford compose the testing crew. One of the men is a lineman, who climbs the pole and clamps the current transformer around the wires, and the other is a tester, who records the readings and directs the work. If the transformers are not too badly scattered we can test from 10 to 15 a night.

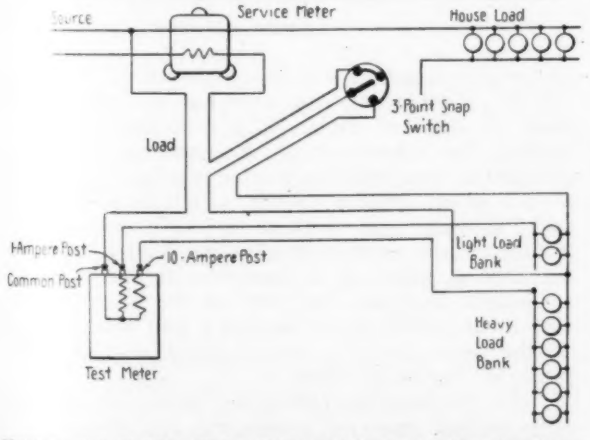
In addition to testing transformers, we frequently use this outfit to test motors and have used it a number of times to test the current in 2400-volt circuits to determine how the current in the three phases was balanced up and to determine the load on a branch circuit. Upon one occasion we tested the current in an 11,000-volt line. In testing on the higher voltages care must, of course, be taken to have the instrument and leads well insulated from ground.

S. C. HESTON.

Method of Switching Meter Coils and Corresponding Loads for Service Meter Tests.

A method of changing from full load to light load coils of test meter without changing connections at the test meter is shown in the accompanying illustration. The diagram shows leads and connections with service meter, test meter, and load bank ready for test. With the position of the three-point snap as shown, the apparatus is set for a heavy-load test. By turning the snap switch to the other position, the light-load section of load bank is connected through service meter and one-ampere coil of test meter, at same time the heavy load is switched off.

All ends of the leads must be properly marked to enable proper connections to be made at beginning of the test. The two sections of the load bank should be adjusted for light and heavy load before test is started, to correspond with the capacity of service meter. With connections and load adjustments properly made,



Method of Switching Meter Coils and Corresponding Loads for Service Meter Tests.

there is no chance of injuring the one-ampere coil of the test meter by overload.

Where service meter is not conveniently located and the tester cannot keep within reach of his test meter throughout the test, this arrangement saves considerable time, since the tester can remain in his position before the service meter while changing test meter coils and test loads.

To make use of this method for testing it is necessary to divide the load bank into two sections, one for light load and one for heavy load.

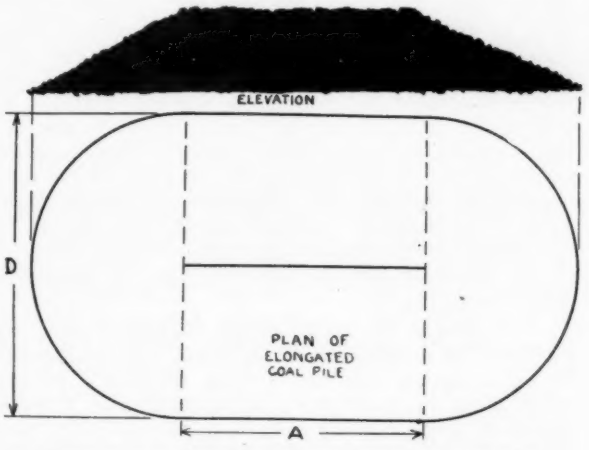
The leads can be simplified by omitting the three-point snap switch and connecting wires from the load bank direct to the load side of service meter. In this case the wires should be marked and only one used at a time to correspond to load desired.

R. E. THATCHER.

Computing Weight of Coal in Elongated Piles.

BY W. F. SCHAPHORST.

When bituminous coal is piled in a conical pile the tonnage in the volume is easily estimated from the



Elevation and Plan of a Typical Elongated Coal Pile.

formula $0.00248D^3$, where D is the diameter of the pile in feet at its base. But coal is often stored in elongated piles similar to the sketch herewith, in which case the tonnage of bituminous coal is computed from the formula

$0.00248D^3 + 0.00474AD^2 =$ tons bituminous, where A is the length of the "crest" on the pile in feet. The best way to determine the length of this crest is to subtract D from the total length of the pile at its base.

The sketch shows one of these piles both in elevation and in plan. The plan shows clearly how the pile can be cut up into three parts. The two curved end portions when added together give us a pure and simple cone, whence we have the $0.00248D^3$ in the formula. The central portion has a triangular section from end to end and its volume is one-half as great as would be the volume of a rectangular block having the same base and height. The tonnage in this central triangular portion is $0.00474AD^2$. Adding the two together we therefore have $0.00248D^3 + 0.00414AD^2$.

Where the coal is anthracite instead of bituminous, the formula becomes

$0.00172D^3 + 0.0033AD^2 =$ tons anthracite.

D and A are both measured in feet.

These formulas are based on the fact that one ton of coal occupies 38 cubic feet on the average, whether anthracite or bituminous. The natural cone of anthracite is 0.25 as high as it is in diameter at its base. For bituminous coal the value is 0.36.

Electrical Construction Notes

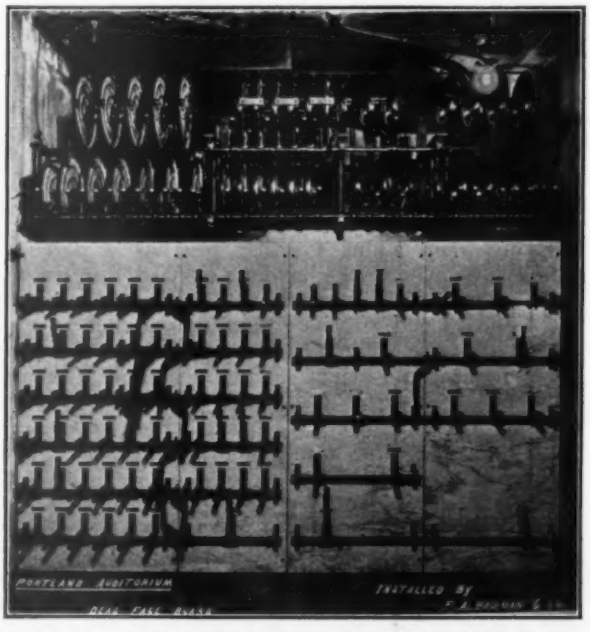
A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL EQUIPMENT OF NEW MUNICIPAL AUDITORIUM AT PORTLAND.

Noteworthy Features of the Electric Lighting Installation.

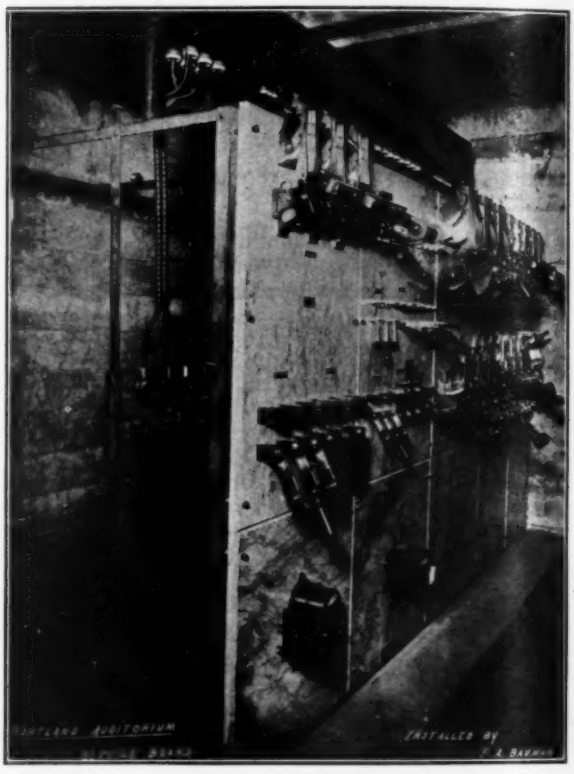
The city of Portland, Oregon, has erected and equipped two public buildings within the last four years which are not only of special civic and educational utility, but which are well up to modern standards in architecture. One of these buildings is the Public Library and the other is the Municipal Auditorium. The library building, besides being advantageously subdivided for library purposes, is provided with seven or eight lecture rooms, in which are given free lectures on educational, historical and scientific subjects. Many such lectures are supplied by members of the faculties of Oregon's educational institutions. The lighting facilities for illuminating all departments of the library and lecture rooms are first-class, current being furnished by one of the electric utility companies.

The Municipal Auditorium, completed this year, occupies an entire city block, being 192 by 200 feet. It has a seating capacity of 5,500 persons. The main floor space is so divided as to make two assembly halls, the floor dipping toward the stage. The partitions are removable, whereby the entire first-floor space may be expanded into one vast auditorium; and a removable oak floor is provided, which may readily be put in place, making a level floor of the same height as that of the stage.



Dead-Face Switchboard Controlling the Lighting of the Municipal Auditorium at Portland. Dimmers Are Shown at Top.

The feature of most interest to ELECTRICAL REVIEW readers is the electrical equipment. The footlights for the stage are built in ten 6-foot sections, and are operated on hinges. The stage is equipped with six



Main Service Board for Portland Municipal Auditorium.

borders, each with 288 lights, arranged 12 lights to a circuit. The feeders for each border consist of 24 pairs of standard cable. The switchboard for controlling the lighting is of the dead-face type, constructed of blue Vermont marble panels. It is equipped with a grand master switch, which controls all the stage lighting. All switches on the board are interlocking. One master interlocking switch and lever operates as many as 21 switches at one time. All extensions from the switches on the board are carried to the point of entrance to a pull box at the top of the board by bare copper strips, rigidly held in place by insulating supports.

The Auditorium exhibition rooms are equipped with conduit raceways connecting 116 threaded cast-iron floor boxes, 16 by 16 by 6 inches, which are installed in the floor every 20 feet and are to be used for exhibition purposes. This does away with unsightly temporary work. The building is well lighted throughout, the ceiling of the main auditorium being wired for nine 6-circuit outlets. The center fixture weighs approximately 1000 pounds. All these ceiling

fixtures are of cast bronze and may be lowered to the floor by differential pulleys for cleaning, relamping or repairing.

The Skinner Company, of Boston, has installed a $25,000 organ, considered the finest of its kind west of Chicago. F. A. Bauman & Company, of Portland, Ore., installed all the electrical equipment. The illustrations given herewith show the dead-front lighting control board and the main service board.

Running Branch Circuit From a Pull Box.

In conduit wiring it is often necessary to run independent circuit for a flatiron, hot plate, vacuum cleaner or similar appliance outlet. Instead of running a separate conduit all the way back to the distributing cabinet, I found that a pull box or junction box can frequently be employed to advantage. In this case a single branch block is placed in the box with an approved cutout with either Edison plug or inclosed cartridge fuse. The box is conveniently located and the circuit is run from this point to the desired outlet in the shortest way. This often saves much wire, conduit and time in installation. Furthermore, frequently there is not room enough in the distributing cabinet for an extra fuse block. Of course, the installation of a junction box must be made in accordance with rules *23b* and *23c* of the National Electrical Code. The former provides that the fuse must be inserted where a change is made in size of wire, which is presumed to be the case where such a branch is taken off. The other rule provides that the fuse must be in an approved cabinet and readily accessible. The circuit also must not be overloaded.

L. F. BLUBAUGH.

The Gum Habit Utilized to Advantage.

A frequent occurrence, when working on small appliances, is to drop parts of an article, such as small washers, nuts, screws, etc., into places that are not accessible to either the fingers or long-nose pliers, should the latter be available. The difficulty is more pronounced if the apparatus is "hot" while work is performed. I have on many occasions made use of the following, the essential part of which is to have chewing gum on hand or be chewing it. Gum will, as all know who use it, attach itself to any object it comes in contact with. By taking some light material, preferably a nonconductor, such as a broom straw, and attaching a small amount of chewed gum on the end the gummed straw can be inserted after the article wanted and will most always secure it. I have several times made use of this method when the object wanted had been dropped in oil. Large parts which can not be lifted in this way may sometimes be moved to within reach. Any gum that becomes attached to the parts can be easily removed and if lost the gum will hardly cause serious damage to any apparatus.

ROBERT OSTER.

To Make Reducing Bushings on the Job.—When in need of a reducing bushing, ¾-inch to ½-inch, and one is a long way from the shop it will be found useful to make a bushing as follows: Take two pieces of ½-inch conduit, each threaded on one end. Put a ½-inch coupling on the threaded ends and draw them up fairly tight. Then take the die stock and run a ¾-inch die over as much of the coupling as is needed to give the desired length of thread.

JOSEPH PERTLE.

Marking Initials on Steel Tools With an Electric Pencil.

There is one way to prevent the theft of pliers, saws, cutters and other small tools and shop equipment, which is to mark each and every piece in such a manner that the lettering can never be erased. For this and other purposes, the usual method is to coat the piece of steel with asphalt paint or wax, and then etch with acid; but the process is crude and painstaking, with the result that pieces are generally left unmarked because of the time and trouble involved.

William Brester, of New York City, has perfected an electric pencil or "etchograph" which permits anyone to write or draw on a piece of steel, so that the marking is etched deeply and permanently. According to Scientific American, his device consists of a pencil and a step-down transformer which may be connected to the nearest alternating-current socket. In instances where alternating current is not available, a direct-current circuit may be used in connection with a small rotary converter or motor-generator.

From the secondary or low-voltage side of the transformer two leads are brought out, one connecting with a metal plate on which the work is placed, and the other connecting with the pencil. The latter has a hardened rubber handle and a metal clamp which holds a short length of ordinary copper wire.

The operation of the "etchograph" is simple: As the electric pencil is drawn over the steel surface of the work, great heat is developed at the point of contact due to the high resistance of the iron or steel. By means of a rheostat control, the etching depth can be readily controlled. The pencil, fitted with a flexible lead, can be handled with the same facility as an ordinary pen or pencil, so that any kind of writing can be done on the work.

Operating on a 110-volt 60-cycle circuit, the transformer draws from 1½ to 2 amperes and delivers a current of about 20 amperes at a potential of 2 volts to the copper point of the pencil. It is said that the "etchograph" is adapted for marking either iron or steel, and all classes of high-speed carbon and machine steel, whether in the hardened or soft condition. It should release the owner of good tools from one of his most insistent sources of worry.

Among the Contractors.

T. Frederick Jackson, Inc., New York City, has received the contract for installing a single-unit lighting system in the armory of the Fourteenth Infantry, Brooklyn, at a cost of $2,983.

J. A. Summers & Son, formerly of Jellico, Tenn., are establishing a shop in Middlesboro, Ky., and will specialize on electrical repair service for the mine operators in the vicinity of Middlesboro.

The Valley Electrical Company, 1817 Tulare Street, Fresno, Cal., has been awarded the contract for the installation of electrical equipment in the Fresno High School at a contract price of $5175.

The Thomas Day Company, 725 Mission Street, San Francisco, Cal., has been awarded the contract for furnishing and installing lighting fixtures in the southeast wing of the San Francisco Hospital. The amount is $7547.

J. J. Beaty, of Lodi, Cal., has been awarded a contract by the city trustees of Lodi for the installation of electroliers in West Elm, West Locust, East Lodi, West Walnut and West Oak Streets. The system will be paid for by the city.

BOOK REVIEWS

"Wiring for Light and Power." By Terrell Croft. New York: McGraw-Hill Book Company. Cloth, 426 pages (4¾x7¾ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $2.00.

Having been such a steady contributor to various technical journals for many years, Mr. Croft needs no introduction to the electrical public, and this volume well sustains his reputation as an authoritative and lucid writer on themes of interest to practical men. Much of the collected material has previously appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICAN and other periodicals, and fortunately so, for the cost of nearly four hundred splendid illustrations would otherwise have considerably increased the cost of the volume.

While the title is appropriate, it might equally well have been called "The How and Why of the National Electrical Code," since it is both a treatise on American methods of installing wiring and an itemized commentary on this code. Compared with most books of its general class, three points stand out strikingly: First, both the wording and the cuts show that the contents were derived to a considerable extent from practical men of high ability. Second, the use of black-face type for emphatic lines and the relegating of the reprinted code sections to small type keeps the volume compact, and yet enables the theme of each page to be found instantly. And, third, the unusual completeness of the index makes every treated item easy of location.

But, aside from its admirable make-up, the volume also shows a fine point of view, namely the author's evident opinion that a proper understanding of the reasons for each code rule, together with a clear indication of ways of complying with the rule, should result in safe wiring. With a copy in the hands of every contractor and architect, the work of the inspectors and the time spent in arguing over faulty wiring ought to be greatly lessened, and the resulting economy in time and materials should profit all concerned. ALBERT SCHEIBLE.

"Telephone Apparatus." George Defrees Shepardson, Sc. D. New York: D. Appleton & Company. Cloth, 337 pages (6x9 inches), 115 illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $3.

It is often difficult for a reviewer to answer the questions, Why was this book written and what useful purpose is served by its publication? With reference to this book the answers to these questions are self-evident. There is no other book on the market which contains such an extended treatment of the basic physical principles of telephone apparatus. It is in no sense merely an explanation of the manner of operation of present day telephone apparatus, but it explains in detail the fundamental physical principles involved in the whole science and practice of telephony. In this respect it occupies a field which has not heretofore been satisfactorily covered.

The book is divided into three parts, which are then subdivided into chapters. The difference between this and other books on telephones will, perhaps, be indicated with sufficient clearness from some of the chapter headings, such as: Telephone Receiver Investigations; Design of Non-polarized Signalling Apparatus; Design of Polarized Apparatus; Principles of Induction Coils; Uses of Induction Coils in Telephony; Condensers in Telephony; and Protective Devices. Nine appendices are added, which consist of mathematical analyses of magnetic and electromagnetic phenomena involved in the operation of telephone apparatus. Another valuable feature is the selected lists of references throughout the book.

The book will undoubtedly be of great value, not only to the student but to anyone whose occupation is such that an understanding of the intricate scientific principles of telephony is necessary. The author is to be congratulated for producing a book of such usefulness. C. M. JANSKY.

"The Electron: Its Isolation and Measurement and the Determination of Some of Its Properties." By Robert Andrews Millikan. Chicago: University of Chicago Press. Cloth, 280 pages, illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.50.

Those who heard Prof. Millikan's address on the measurement of the electron some years ago before the Electric Club of Chicago will remember the unusual clearness with which he handled this difficult subject. The same clarity of expression, coupled with a logical sequence of the different chapters and a painstaking precision, pervades this volume which is intended for men of technical training regardless of whether or not they are physicists. Indeed, a considerable portion of the volume makes interesting reading even for the lay reader and will give him a good idea not only as to the subject matter from which the book takes its title, but also as to the most modern views on atoms, electricity and radiant energy. Thus, the opening chapters trace the different atomic theories of matter in their evolution from the days of Democritus (400 B. C.) to the present, and the development of electrical theories from Franklin's original conception through a considerable range of others and back to a modern electron theory strongly resembling Franklin's.

Naturally, a large portion of the volume is devoted to the work of various physicists in measuring the electron or "natural unit of electricity," and in measuring the ionization of gases. But, while this includes an extensive account of the work conducted at Ryerson Laboratory under Prof. Millikan's direction, including the use of his electrical balance for accurately determining weights down to one ten-billionth of a milligram, due attention is also given to the experiments of others. In this connection, an interesting chapter is devoted to the suggested subelectron (or charge of electricity smaller than the electron) and to a refutation of various attempts towards proving the existence of such smaller charges.

Having thus set forth the nature and size of the electron and the methods of isolating and measuring it, the author devotes added chapters to the structure of the atom and to the nature of radiant energy. Due credit is given to Moseley for his work in X-ray spectrometry and his resulting discovery that the characteristic frequencies (or wave lengths) of the different elements form a simple and uniformly progressing arithmetical series, thereby affording new proof that these elements constitute a closely related family which may all have been evolved from hydrogen as the primordial element. Of course, the former ether-stress theory of electricity is crushed by this more recent electron theory, particularly as the latter has the advantage of being backed up by definite measurements, and those who are familiar with Oliver Lodge's "Modern Views of Electricity" will be particularly interested in this volume as showing the remarkable progress made. ALBERT SCHEIBLE.

Electrical and Power Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Spartan Porcelain Current Taps.

Oftimes it becomes necessary to provide a connection for fan motor, heating pad, or other current-consuming device in a room where there is no convenient receptacle and where the electric lamp must be retained at its original location.

For just such conditions, the Spartan porcelain current tap was designed. This device, manufactured

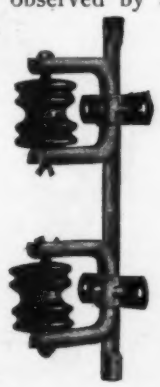
Bryant Porcelain Current Tap.

by the Bryant Electric Company, Bridgeport, Conn., is virtually a ready wired socket adapter with a standard slotted receptacle in its side for receiving any standard cap or plug. One end of its body is fitted with standard screw plug, just like a regular lamp base, the other end is designed to receive a standard medium-base lamp. Thus a lamp may be removed from its socket, the Spartan tap put in its place, and the lamp screwed into the outer end of the tap.

This device can be furnished for multiple connection or series connection. The former is known as catalog No. 101 and the latter as No. 102.

Presteel Racks for Secondary Distribution.

The distribution system of a central-station company, on account of its great extent throughout the city, is continually observed by all residents in the community. For this reason it should be neatly built. At the same time, on account of the large investment necessary, it should be constructed as economically as possible consistent with neatness and strength. In the way of pole fittings an important advance has recently been made in carrying out both the above requirements through the development of what are known as Presteel racks, which permit carrying one or more wires from the side of the pole direct to a similar rack at the house service. These racks are of light weight and yet of great strength. They are suitable for carrying No. 3 or lighter weight wires.



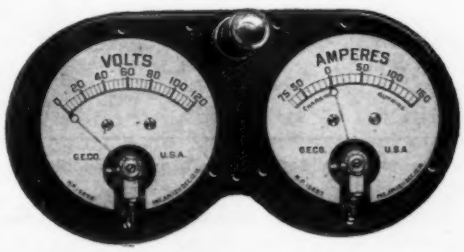
Hubbard Presteel Two-Wire Rack.

In the accompanying illustration is shown a two-wire rack with wires spaced 6 inches apart. The over-all length of the rack is 12 inches. It can be securely mounted along the pole or at the side of the house. These brackets are hot-galvanized and therefore exceptionally well protected from rusting. They make a very neat and substantial installation at a cost which is said to be actually lower than that of most pin-type brackets. These racks are made to support up to five wires. It has been found that the running of wires one over the other avoids interference, is economical of space, and, by eliminating the need for crossarms, makes for a very neat installation.

These devices are manufactured by Hubbard & Company, Pittsburgh, Pa.

Combination Volt-Ammeter Simplifies Instrument Installation.

The General Electric Company has developed a new direct-current duplex instrument with self-con-



Small Illuminated Combination Voltmeter and Ammeter.

tained attachment for illuminating the dials. This volt-ammeter is particularly adapted to electric vehicles and small direct-current panel applications, such as are used for battery-charging sets and lighting.

It is called the Type DK 7 and consists of an ammeter and a voltmeter mounted on a bakelite base with outside dimensions of 5½ by 2⅞ and 1⅜ inches deep. Separate instruments of the same construction are supplied and known as the Type DM.

The D'Arsonval permanent-magnet moving-coil construction is used in both elements. The resistance for the voltmeter is self-contained, but the ammeter requires an external shunt. The instruments are fin-

ished dull black and can be equipped with paper scale with black marking or with metal scale plate and white figures on black background. The standard voltmeter capacities range from 10 to 150 volts and for the ammeter any desired capacity can be obtained, either for one-way indication or double, showing charge and discharge readings.

For electric vehicles cable leads are furnished for connection to terminals set in back of the instrument, so that all wiring can be concealed. For panel work, stud terminals can be supplied, which serve as terminals and holding lugs.

Safety Tapping Machine for Connecting to Live High-Voltage Lines.

In all high-voltage power transmission continuity of service is one of the prime requirements. When a line is being extended or branches are being tapped from it, it is therefore desirable that this be done without interrupting the service. Of various methods devised to accomplish this one of the most ingenious

Fig. 1.—Bush Safety Hot Tapping Machine.

is that recently perfected and marketed by H. B. Bush, of Redlands, Cal.

In Fig. 1 is shown a general view of the Bush device, which he calls his safety "hot" tapping machine. It will be observed that it has two long insulating handles, one serving as the stem for holding the device and the other as the operating shaft, by means of which the wire is connected. One end of the tap wire is fastened to the dead branch line and the other end is fed into the machine. By turning the crank the machine fastens itself onto the main line wire and wraps the tap wire around the main line in exactly the same manner as the lineman would do it by hand. When the wire is securely fastened in this way the crank is turned backward, which causes the machine to unlock itself from the main line, so that it can be easily removed and reloaded for another tap. A closer view of the head of the machine is shown in Fig. 2. In Fig. 3 is shown a completed branch tap, in which the branch was No. 6 and the main No. 1.

This device now makes it a needless waste of time and interruption to shut down the high-voltage main

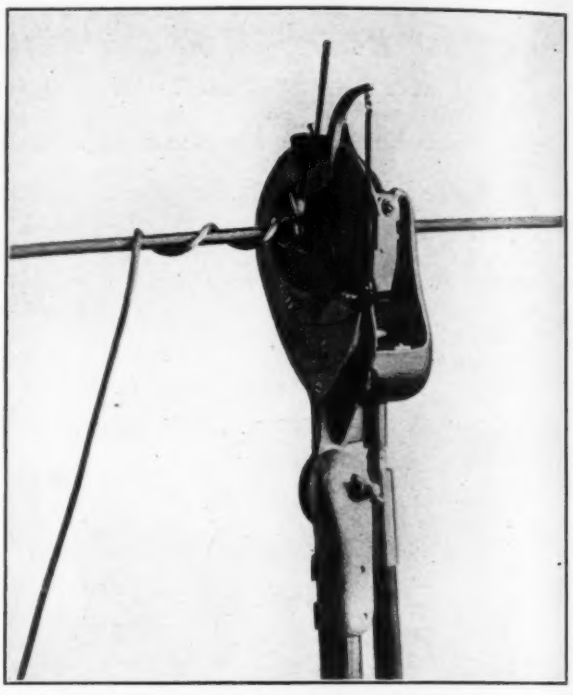


Fig. 2.—Close View of the Head of the Tapping Machine With a Tap Half Made.

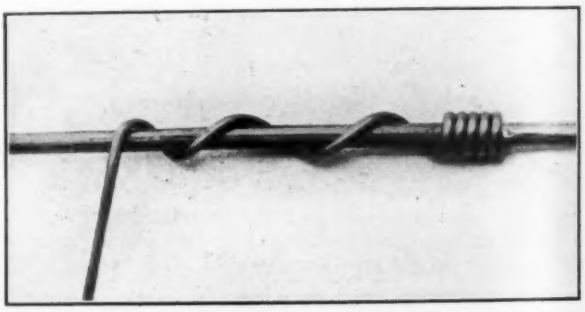


Fig. 3.—A Completed Tap of No. 6 Wire to a No. 1 Main.

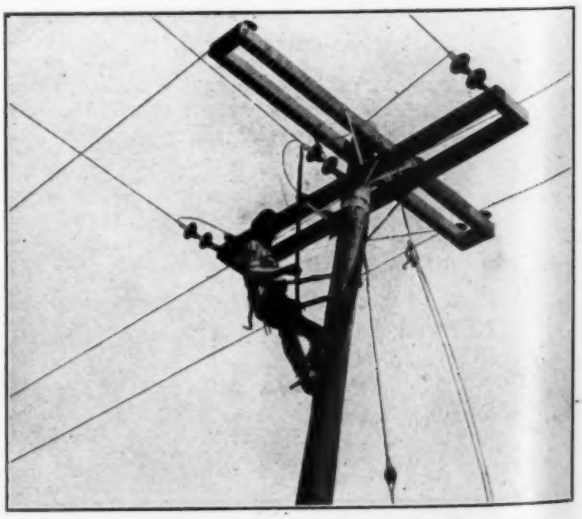


Fig. 4.—Lineman Cutting a Tap Wire With a Bush Safety Hot Wire Cutter.

line in order to tap on the branch. It is stated that the machine will tap a branch onto a live line, making a better job than a lineman could do it even after the line had been isolated and killed.

Mr. Bush has also invented and is manufacturing a safety "hot" wire cutter to permit disconnecting a branch from a high-voltage line. A view of a lineman cutting a tap wire with this safety cutter is shown in Fig. 4. Both these devices have been submitted to leading transmission engineers and after thorough testing have been found to be entirely satisfactory.

United States Government Buying Soot Blowers for Boilers in Army Camps.

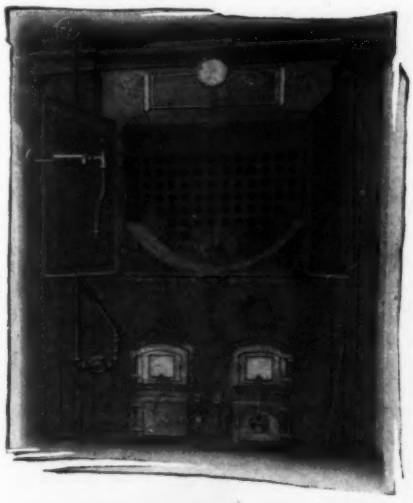
The United States Government has recently placed a large order with the Diamond Power Specialty Company, Detroit, Mich., for Diamond soot blowers to equip completely the boilers installed for heating and refrigerating purposes in the first American cantonment in France. The blowers furnished are of the model F front-end type, illustrated herewith.

The blower proper consists of a revolving arm carrying Diamond Venturi nozzles. When the steam is on and the arm is revolved, by means of a wheel on the outside, a jet of steam is shot directly into each tube at a velocity of about 2795 feet per second.

Both the tubes and the combustion chamber are cleaned at the same time. The sweeping of the arm, as it swings in a complete circle, allows the steam to be shot directly into the tubes on a straight line and the corner tubes are taken care of with the same thoroughness as the center ones.

The swivel coupling makes it possible to open both boiler doors at any time without disconnecting or cracking the blower piping.

Each blower unit is supported on the door, and when the door is opened the entire mechanism swings out with the door, leaving the boiler ends free and clear for inspection, repairs, etc., and exposing and

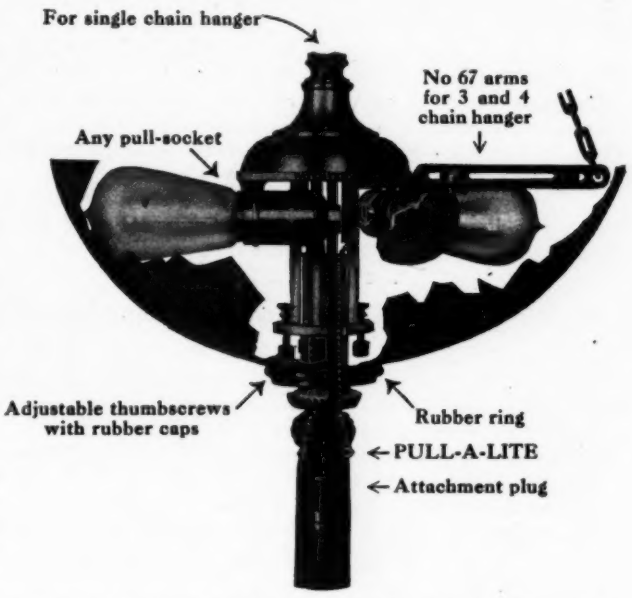


Diamond Soot Blowers of This Type Are Installed on Boilers for American Army Camp in France.

making easy of access any part of the blower. The equipment is described in detail in bulletin No. 121 issued by the company.

Ingenious Control for Semi-Direct Fixtures.

Many buildings have been wired without due consideration for the control of fixtures from wall switches. Not only is this true as regards small single-light fixtures used in the smaller rooms, but even so as regards three or four-light fixtures used in living



Semi-Indirect Fixture With Bowl Broken Away to Show Construction of the Pull-a-Lite Fixture Device.

and dining rooms and the like. An ingenious patented fixture-control arrangement has been devised to overcome this difficulty. It is known as the Pull-a-Lite, because it provides for lighting anywhere from one to four lamps on a fixture merely by pulling the cord for the corresponding lamps.

The construction of the interior of the fixture is shown in the accompanying illustration. It will be observed that it consists of a central support on which are lugs for horizontally mounting as many as four pull sockets of any standard make. The upper part of the support is arranged either with some ornamental cover used purely for decoration or for the attachment of a single supporting chain or stem. When it is desired to use three or four chains these are attached to adjustable arms that can be mounted on the central support. These arms can be changed as to length to fit any desired size of bowl.

The attachment between the central support and the globe is made in the center of the latter, where a hole 1.25 inches in diameter is drilled in the glass. Through this the lower portion of the support extends. A thumbnut separated from the glass by a rubber ring or gasket and above the glass by means of several adjustable thumbscrews with rubber caps is used to clamp the support to the bowl. This method of mounting is not only easily and quickly applied, but requires only a single hole in the bowl and puts no strain on the latter, because the support is cushioned on either side of the glass. The thumbscrews can be adjusted to make the bowl hang exactly level. The chains for the individual sockets pass through the support and the hole in the glass and project a slight amount below the bowl.

Usually the lower portion of the attachment exterior to the bowl has mounted on it a silk tassel. This serves not only for ornamental purposes, but also to render these projecting cords inconspicuous and to cover entirely in the interior of the tassel an attachment plug which is especially provided for use in din-

ing-room fixtures, where it is desired to connect a toaster, percolator, fan or other convenient electrical table appliance. If the attachment plug and tassel are not desired the short cords alone may project from the bottom of the fixture.

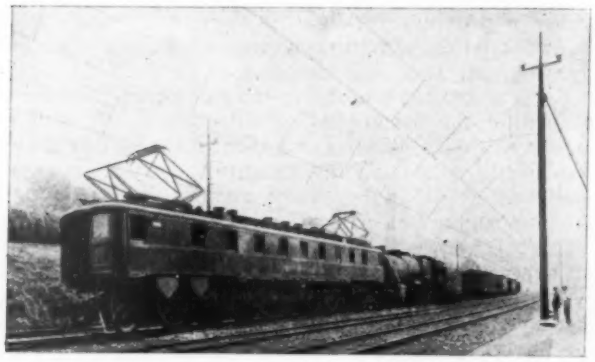
It is readily seen that by means of this device it is possible to place in the fixture lamps of suitable size and number, such as, say, two 25 and two 40-watt lamps. Since each of these is individually controlled the fixture can be regulated to furnish from 23 to about 120 candlepower.

This fixture device can be used with practically any type of semi-indirect bowl. It is manufactured and marketed by H. A. Bauer, Lansdowne, Pa.

World's Most Powerful Locomotive Being Tested.

In the vicinity of Philadelphia the Pennsylvania Railroad Company has been testing the world's most powerful locomotive. This electric locomotive is capable of exerting a maximum horsepower of 7000, and is intended for the mountain-grade electrification between Johnstown and Altoona, Pa., around the famous Horse Shoe Curve. During a recent test this locomotive hauled a train of 68 cars, and the regular Mikado type of steam locomotive. The latter, however, remained idle.

The mechanical parts of this electric engine were built by the Pennsylvania Railroad Company at its Juniata shops at Altoona, Pa., and the electrical equipment supplied by the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company.



Herculean Electric Locomotive Undergoing Test.

Two locomotives are able to haul a 6400-ton train up this mountain grade at a speed of slightly over 20 miles per hour, thus relieving, when necessary, the congestion that seems apparent in that freight traffic over this division now, which is unusually heavy, amounting to as much as 300,000 tons per day. In addition to the heavy grade over the Allegheny Mountains a long tunnel, which helps to form the "narrow neck in the bottle" in operating over this division, must be passed through. By electrification the expense of grade reduction has been eliminated and the capacity of the division will be more than doubled.

The Westinghouse Electric equipment is so designed and built that these locomotives can haul the heavy trains up hill and coast down hill at the same speed of 20 miles per hour. By the motors becoming generators in the latter case effective braking action results without the use of air brakes. This coasting speed can be regulated just as speed up-hill or under power. The air brakes are therefore not needed while coasting, and are simply held for emergency use and bringing the train to a full stop.

Current Transformers for Tripping Oil Circuit-Breakers.

A current transformer designed particularly for tripping oil circuit-brakers has been developed recently by the General Electric Company, Schenectady, N. Y. It is known as the type Y-285, form A and is furnished in capacities from 5 to 800 amperes at 4500 volts or less.

Two styles are available. The first is for use up to 300 amperes and the second from 300 to 800 amperes. Either can be used with oil circuit-breakers for tripping directly or in connection with relays. In addition to the trip coil or relay an ammeter may also be connected to the transformer when the trip coil does not require more than 70 volt-amperes at 5 amperes.

Fig. 1.—Current Transformer for 0-300-Ampere Oil Circuit-Breaker.

The 5 to 300-ampere transformer (Fig. 1) is equipped with a cast metal base with two bolt holes for mounting on a flat surface, or by means of fittings on pipe supports. The secondary leads are supported by bushings in two small metal plates fastened with flat terminals for bolting to similar terminals on cable leads.

The higher capacity transformers for use from 300 to 800 amperes inclusive (Fig. 2) are of the bus type and are supported by bolting the primary in the bus or connection bar or to the stud of the oil circuit-breaker. No base is required. The secondary leads are supported by bushings in two of the metal plates which help to hold the transformer laminations in place.

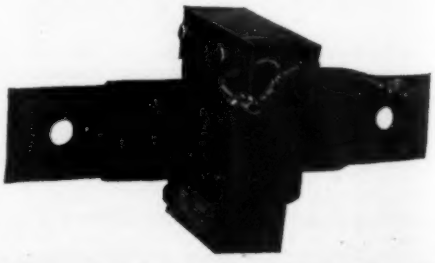


Fig. 2.—Current Transformer for 300-800-Ampere Oil Circuit Breaker.

Activities in the Trade

Electrical Sales Company, New York City, has removed its headquarters from 114 Liberty Street to 30 Church Street, Room 918.

Fidelity Electric Company, 331-7 North Arch Street, Lancaster, Pa., has received a contract for a number of electric generators for the Government. The company specializes in the manufacture of generators, motors and dynamos.

Badt-Westburg Company, Monadnock Block, Chicago, announces that on November 1 it effected a change of its corporate name to **Westburg Engineering Company.** No change of management or policy is involved and the company continues to represent the Weston Electrical Instrument Company and the Ward Leonard Electric Company.

Royal Electric Manufacturing Company, 606 East Fortieth Street, Chicago, Ill., is sending out bulletin No. 5 on Royal outdoor substation equipment. Included in it are air-break switches, disconnecting switches, choke, coils, horn gaps, and various combinations of these elements for switching or protective purposes. These equipments are furnished for circuits up to 44,000 volts.

Chicago Mica Company, Valparaiso, Ind., is distributing catalog No. 21 on "Champion" insulating materials. It deals particularly with Champion oiled cambric and Champion tapes. The cambric is made in thicknesses from 5 to 15 mils and is furnished in rolls of 25, 50 and 100 square yards. The tapes are cut bias or straight and are obtainable in widths from three-eighths to three inches. These oiled fabrics have very high insulating qualities.

The Chelten Electric Company, Philadelphia, is distributing its 1918 catalog, in which all this company's wiring devices are described and illustrated in an effective manner. Among those that may specially be mentioned are the Chelten shallow flush push-button switch, the material and mechanism of which are shown; lock switches of the same type; Keystone flush push-button switches; and Chelten switches with composition base; surface snap switches, brass plates, switch plates, receptacles, attachment plugs, extension cord connectors and Chelten non-arcing enclosed fuses. This company has sales representatives in all the principal cities of the United States, and is represented also in Buenos Aires, Sydney and Havana.

Fort Wayne Correspondence School, Fort Wayne, Indiana, in a large, illustrated folder, makes a forceful appeal to young men to prepare themselves for efficiency in the meter engineering field, where there is great demand, present and prospective, for competent men. In this message to ambitious young men is presented the fact that there are over 7,500,000 meters in use in this country, with the estimate that half a million more will be installed during 1918. It is shown, also, that positions in meter engineering pay $1200 to $3000 per year, and that there is not nearly a sufficient number of practical meter men to supply the demand. The way to success in fitting a young man to become a meter engineer is clearly set forth in this striking piece of literature, the course provided by this school enabling the student to learn while he earns. The importance of the electric meter to the central station is illustrated by the statement that the management must pay as much attention to its meters as the merchant does to his cash register; and central-station managers want men who know meters and know how to fix them and keep them in order. The opportunity is not limited to young men. It is equally open to the man of forty to fifty. The kind of instruction offered by the Fort Wayne Correspondence School is of the practical kind that fits a man for actual work. This comprises lesson books, with illustrations and diagrams, and other means of learning how meters operate, how to connect meters with various instruments, how to read them quickly and accurately. The complete course is outlined, with much other information concerning the school's faculty and its facilities. Many testimonials are given of students who have taken this course, and who are now in good positions, and in line for advancement.

Westinghouse Electric & Manufacturing Company's employees, when the second Liberty Loan campaign was announced, organized for effective work in securing bond subscriptions, setting their goal at $1,500,000, and at the close of the campaign it was found the amount subscribed amounted to $1,610,000. Employees of the Westinghouse subsidiary companies subscribed $620,000, and the Westinghouse Electric & Manufacturing Company itself subscribed $2,500,000, making a grand total of $4,730,000. An interesting fact in connection with this is that, out of a total of close to 30,000 employees of the company, 22,000 of them subscribed for bonds. The employees, with the hearty approval and co-operation of the management, accomplished this result by organizing for effective team work, in which about 400 of the best salesmen engaged, to interview every employee. In some cases office boys, or others, were aided by men in their respective sections in buying bonds. The entire procedure was an example of effective team work, backed by a sense of patriotic duty.

"Lux Side-Lights" is the name of an attractive little magazine which the employees of the Lux Manufacturing Company, Hoboken, N. J., have published under date of October 1, and which will be continued monthly. A. L. Lewis, sales and advertising manager of the company, is editor. One of the many interesting features of the first issue is an article by Otto Foell, vice-president and one of the founders of the company, entitled, "Our History." The Lux Manufacturing Company, Mr. Foell writes, was founded in 1911. The original equipment consisted of machines necessary to produce about 150 lamps per 10-hour day. In April, 1912, A. T. Baldwin became president of the company and simultaneously the equipment was increased so that approximately 1,000 lamps could be manufactured per day. The growth of the company has been almost phenomenal and in July of 1913 the company moved into a large modern factory at Hoboken. There are a number of other interesting articles and notes particularly of interest to employees. In fact, the magazine gives one the impression that he has had an insight into a happy, contented family.

National X-Ray Reflector Company Issues an Unusual House Organ.—Each month there comes to the desk of every electrical jobber, dealer, contractor and engineer, as well as to the entire personnel of the central-station industry, also to more than five thousand architects, a publication known as "Eye-Comfort." The usual precedent which seems to govern the publication of all house-organs has evidently been thrown into the discard by the editor, for, instead of "Eye-Comfort" appearing in a 6 by 9-inch bound pamphlet form, it comes in the more generous dimensions of 8 by 10-inch and consists of a modest yet well arranged portfolio for a cover, in which one finds loose sheets of either two or four pages, covering various subjects such as Store Lighting, Show-Window Lighting, Flood Lighting, Industrial Lighting, Show-Case Lighting, etc. After a year of "Eye-Comfort" issued in this form Norman B. Hickox, sales and advertising manager of the National X-Ray Reflector Company, states "The many compliments we have received from publishers and advertising men in all lines, the evident efficiency of such an arrangement from a reference standpoint, and the fact that the use of the loose pages by members of the electrical trade has proven a valuable assistance in business getting, assures the continuance of 'Eye-Comfort' in its present popular form. We attribute in no small degree the continual gratifying increase in our business to its publication." It can be easily realized that any electrical man may distribute the issue, when received, among several interested prospects in various classes, and the fact that there are several thousand numbers printed of each edition, in addition to those necessary to take care of the regular mailing list, all of which extra numbers are greedily absorbed, is only another evidence of the success of the plan. "Eye-Comfort" will be sent free upon request to any one interested in the promotion of better illumination. Address the editor at 235 West Jackson Boulevard, Chicago.

Men in Government Service

Items of Interest Concerning Power and Electrical Men Who Have Joined the Colors

C. W. MAGEE, formerly in electrical work at Detroit, Mich., is now with the United States Army in France.

PROF. R. B. OWENS, formerly of McGill University, Montreal, Canada, is now a major in the U. S. Signal Corps, stationed at Washington, D. C.

L. THOMS, of the Chicago office of the Westinghouse Electric & Manufacturing Company, has resigned to enter the employ of the United States Government in the Research Laboratory at Washington.

NASHVILLE (TENN.) RAILWAY & LIGHTING COMPANY is displaying a service flag with 28 stars beneath its waving electrical flag on its Church Street office building in Nashville. The names of these 28 employees of the company, who have entered Federal service, are inscribed on a roll of honor in the company's office.

ARTHUR E. ALLEN, manager of the supply department of the New York district office of the Westinghouse Electric & Manufacturing Company, who is a Canadian citizen, has resigned to join the Royal Engineers. Charles E. Stephens, formerly in charge of the illuminating and rectifier section at East Pittsburgh, has succeeded Mr. Allen.

LIEUT. RAYMOND BALDWIN, one of the directors of the Lux Manufacturing Company, Hoboken, N. J., and son of A. T. Baldwin, its president, has earned considerable recognition through patriotic services which he voluntarily rendered France. Young Baldwin served in the hospital division, known as Harje Formation, for over a year, with the Allies, and after a short visit in the States, returned recently to France in service of the United States Army, as a member of Aviation Corps.

G. E. FUSS, formerly in electrical work for Standard Oil Company, at Whiting, Ind., has enlisted in the United States Navy.

C. A. BALES, electrician, formerly with Sylva Tanning Company, Sylva, N. C., is now in Army service, with First Field Signal Battalion, Greenville, S. C.

S. M. JASEKE, consulting electrical engineer, Chicago, is now a member of Company K, 343rd Infantry, now in training at Camp Grant, Rockford, Ill.

J. E. DE LONG, secretary of the Rutenber Electric Company, Marion, Ind., has enlisted as a first lieutenant in the Ordnance Reserve Department and has entered on his duties.

MAJOR CHAS. P. BRUCH, of the Signal Corps Reserve, U. S. Army, vice-president of the Postal Telegraph-Cable Company, New York, and a member of the sub-committee on telegraphs and telephones of the Council of National Defense, is one of the most progressive of the men in the telegraph service, and his extensive knowledge in telegraph affairs is helping the Government. Major Bruch is also president of the Ohio Society of New York.

NATIONAL METAL MOLDING COMPANY, Pittsburgh, Pa., reports twenty-five of its employees now in military service. Of this number twenty left from the factory, four from the factory office and one from the general office of the company. A much larger number has been registered and are ready to go when called. John P. Corrigan, a Cornell student, son of Vice-President C. E. Corrigan, has been in the Naval Coast Defense Reserve for some months and was recently promoted to quartermaster, third class. The company's chief engineer, H. G. Osburn, has been called to Washington to serve indefinitely in Government standardization work.

PADUCAH LIGHT & POWER COMPANY and the PADUCAH TRACTION COMPANY, Paducah, Ky., has granted fourteen employees out of the force of one hundred leave of absence to enlist in one or another branch of the Federal military service. Of the fourteen only one was a drafted man.

PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS in its November Public Service Lumen, lists the names of 155 employees of the company, from the general office and all divisions, who have joined the Army and Navy. Most of these men are now in various training camps, but some are in American military units already in France. A number hold rank of officers in both arms of the service. This list will be increased in number when the final call is made for men holding draft numbers which have been drawn and when others who have enlisted in the Signal Reserve Corps are ordered to report.

THE A. C. GILBERT COMPANY, New Haven, Conn., furnishes the following names of 23 of its employees who are in military and naval service of the United States: Harry E. Sherwin, captain, Infantry; Harold B. Foster and Victor Thompson, first lieutenants; Clyde H. McCarter and Francis A. Degnan, Ambulance Corps; Glen C. Athey, Francis P. Gordon and Harry T. Grund, Field Artillery; John Kevorkin, James T. Carr, Austin Murdock, Henry Cassan, William Hannan, J. I. Horowitz, John King, George Grisback, W. H. Sullivan and Simon Olovitch, Infantry; Samuel E. Shea, Robert Thompson and Harry Gow, Navy; Ormond Bates and A. W. Williams, Ordnance Department.

Personal and Biographical

J. D. MILBURN, better known in the Southwest, from whence he hails, as Jack Milburn, has joined the sales force of Page & Hill Company, Minneapolis, dealers in cedar poles.

CHARLES W. JOHNSON, general superintendent of the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company, was recently elected vice-president of the American Institute of Metals.

E. H. PALMER, president of the Empire Gas & Electric Company, Geneva, N. Y., was elected president of the Empire State Gas and Electric Association at the annual meeting recently held in New York City.

H. F. FETZER is now in the industrial department of the Westinghouse Electric & Manufacturing Company, Chicago. Mr. Fetzer has been engaged in the electrical contracting business in Chicago since 1902.

W. E. SEIPLE has entered the sales department of the Westinghouse Electric & Manufacturing Company, with headquarters at Wilkes-Barre, Pa. Prior to this affiliation he was connected with the Harrisburg Light & Power Company, Harrisburg, Pa.

R. K. SMITH has been appointed treasurer of the Postal Cable Company of Texas, succeeding Fred W. Werth, who resigned to enter the United States Navy. Mr. Smith, in 1914, was manager of the company's office at Fort Smith, Ark., and later held a similar position at Alexandria, La.

E. C. HAGAR, electrical engineer for the Solvay Process Company, Syracuse, N. Y., presided at a dinner recently tendered to five former employees of the company who were pensioned after long years in its service. The guests were: F. C. Hewitt, G. G. Cotton, H. E. Tiffany, A. DeMattia and W. H. Angell.

WILLIAM WATSON, who was auditor of the Alabama Power Company's operations at Albany, Ala., has been made manager of the company's operations at Talladega. Robert Jones, of Huntsville, succeeds him at Albany. Earl Wilson will go from Talladega to Birmingham as head of the new department created there, while Walter Smith will be auditor at Huntsville.

W. S. WATSON, who has been connected for the last six years with the sales department of the Bogue-Wensley Lead Company, Denver, Colo., has resigned and accepted a similar position with The Advance Machinery & Supply Company, Gas and Electric Building, Denver, in a similar capacity. The latter concern handles steam and electrical specialties and is district representative of the Duryea Manufacturing Company, Fisher Governor Company, Cling-Surface Company, Yarnall-Waring Company, Richardson-Phenix Company, Nelson Valve Company, Flexible Steel Lacing Company, Betson Plastic Fire Brick Company, The Peerless Alloy Company.

HOWARD B. SHAW, former dean of the Engineering Department of the University of Missouri, whose appointment as directing head of the Schools of Practice of the Doherty Organization was announced in our issue of September 8, is a man of Maine by birth, and a North Carolinan by later adoption. He received A. B. and B. C. E. degrees at University of North Carolina, and that of A. M. at Harvard. He has held professorships in those two universities and in the University of Missouri, and subsequently served as a member of Public Service Commission of Missouri. Mr. Shaw has had a great deal of engineering practice, and is the author of a number of books on engineering. The first of the Schools of Practice was established in

Howard B. Shaw.

Denver 12 years ago, and more recently others have been established at Toledo, Bartlesville, Okla., and Titusville, Pa. The student cadets take up gas and electricity at Denver, electric traction at Toledo, gas and oil utility at Bartlesville and oil refining at Titusville. The work of all these schools is supervised by Mr. Shaw, who is a member of American Institute of Electrical Engineers and other engineering and scientific societies.

CHARLES R. ABLETT, connected with the Hygrade Lamp Company as New York representative for many years, has resigned to go into business for himself under the name of the Charles R. Ablett Company, 30 Church Street, New York.

ALBERT V. MILLER, connected with the Metropolitan Edison Company, has resigned to become associated with the Lebanon Steam Heating Company, Lebanon, Pa., in the capacity of superintendent, succeeding George Krall, who retired, due to ill health.

NORMAN B. HICKOX has been appointed sales manager for the National X-Ray Reflector Company, Chicago, succeeding Ernest H. Cameron. Mr. Hickox will continue the direction of publicity work. Hugh D. Butler has been appointed assistant sales manager and will devote particular attention to campaign work on special class business and direct architectural and maintenance features. Guy R. Hastings is now manager of Chicago sales.

O. L. SHORE, superintendent of municipal hydroelectric plant and water works, Niles, Mich., has tendered his resignation, to take effect December 31, and probably will connect himself with some central-station organization.

A. L. SMITH, JR., is now with the Rathbone Sard Electric Company, of Albany, N. Y., as its New England representative for the sale of ranges and heating appliances, with an office at 65 High Street, Boston, Mass. Mr. Smith, who is well known in electric circles, held the position of range specialist for the Edison Electric Illuminating Company of Boston for a number of years.

F. V. GANTT, president of the Louisville, Ky., Jovian League, and manager of the Louisville Branch of the General Electric Company, has gone to Cincinnati where he will have charge of the central station and electric railway sections. On Friday, October 26, Mr. Gantt was a guest of honor at a farewell luncheon given by the Louisville Jovians and was presented with a handsome and appropriately engraved cigarette case by the League. Walter S. Clark, of the James Clark, Jr., Electric Company, vice-president of the League, becomes acting president.

SAM A. HOBSON, for the past five years western manager of the *Electrical World*, has resigned, effective January 1, 1918, to enter the field of electrical merchandising. Mr. Hobson has a wide acquaintance in the electrical industry and his work has brought him in contact with every branch of the business. He was first connected with the Wyatt Park Street Railway Company of St. Joseph, Mo., later having charge of the construction and operation of the Electric Railway & Light Company of Waco, Tex., and of the Electric Railway Company of Atlanta, Ga., and others. From 1897 to 1907 he was sales manager of the Hobson Electric Company, Dallas, Tex. During his association with this company he assisted in founding the Jovian Order and later became its third Reigning Jupiter. From 1907 to 1911 he was manager of the apparatus department of the Wesco Supply Company, St. Louis, leaving that position to become manager of the St. Louis office of the Fort Wayne Electric Works.

Obituary.

JULIAN L. WELLS, connected with the Mexican Light & Power Company, Santo Domingo, Mexico, as engineer, died October 26. His death was caused by appendicitis.

HENRY R. FORD, vice-president of the firm of McCarthy Brothers & Ford, electrical engineers, Buffalo, N. Y., died October 31, at his home, 114 Windsor Avenue, aged 46 years. He is survived by his widow and three children.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

RUTLAND, VT.—Rutland Railway Light & Power Company is planning for the immediate installation of two new 1000-kilowatt transformers in the West Rutland station. The company is rushing to completion the installation of a new water wheel at its Pittsford station.

SPRINGFIELD, MASS.—Standard Electric Time Company, 89 Logan street, manufacturer of electric clocks, etc., has awarded a contract for the construction of a three-story addition, about 35x105 feet, to its plant. The structure will cost $25,000. E. T. Davis & Son, 157 Lebanon street, Springfield, are the contractors.

TAUNTON, MASS.—Bristol Electric Company has incorporated with a capital of $5000. L. E. Beachamp, A. E. Downey and H. P. Hickey are incorporators.

PLAINVILLE, CONN.—Trumbull Electric Company is building a three-story and basement addition to its plant, about 50x100 feet, to cost about $50,000.

WATERBURY, CONN. — Housatonic Power Company, West Main street, has awarded a contract for the erection of its proposed one-story power house, about 61x97 feet, to cost about $40,000. Tracy Brothers Company, 52 Benedict street, Waterbury, has the contract for construction.

ALBANY, N. Y.—Seneca Electric Furnace Corporation has filed notice of a change in its corporate name to the Ludlum Electric Furnace Corporation.

BINGHAMTON, N. Y.—Binghamton Light, Heat & Power Company has completed the construction of its outdoor high tension substations and 33,000-volt transmission line, and will inaugurate operations at an early date. It is expected to carry a considerable portion of the load of the old plant. The company is perfecting arrangements for running three-phase lines to the new plant of the Hires Condensed Milk Company, now in course of construction, and which will require about 250 horsepower.

BRIDGEFORD, N. Y.—Bridgeford Machine & Tool Corporation has awarded a contract for the erection of its proposed one-story and basement power house at North Third street and the New York Central Railroad, Rochester. Fred Belt, 42 Copeland street, Rochester, is the contractor.

BROOKLYN, N. Y.—National Aniline & Chemical Company, 8424 Ditmars avenue, is having plans prepared for the improvement and extension of its one-story brick power plant, about 78x149 feet, at Eighty-third street and Ditmars avenue, to cost about $30,000.

GAROGA, N. Y.—Garoga Electric Power Company has incorporated with a capital of $200,000. The incorporators are W. A. Dunne, J. T. Norton, and G. C. LeCompte, Troy.

NEW YORK, N. Y.—Public Service Power Company has incorporated with a capital of $250,000. The incorporators are J. F. Hory, C. H. Stanton and W. M. Card, 32 Broadway.

NEW YORK, N. Y.—New York Telephone Company, 15 Dey street, has awarded a contract for alterations and improvements in its telephone exchange plant at 30-32 East Twenty-ninth street, to cost about $30,000. W. A. L'Hommedieu & Company, 1 Madison avenue, are the contractors.

ROCHESTER, N. Y.—Rochester Railway & Light Company, 34 Clinton street, has awarded a contract for improvements in its plant to cost about $75,000.

SYRACUSE, N. Y.—Dyneto Electric Corporation, 301 Wolf street, manufacturer of electric apparatus, has acquired property in Park street, consisting of a four-story brick factory building, about 75x100 feet, and will utilize the structure as an addition to its plant. This will considerably increase the capacity of the company, and will require the employment of additional hands.

NEWARK, N. J.—Miner Edgar Company, Blanchard street, has awarded a contract for the erection of a four-story power house, about 70x163 feet, to be constructed at its plant. Frederick Kilgus, Inc., 13 South Sixth street, Newark, is the contractor.

NEWARK, N. J.—Public Service Electric Company will immediately install at its Essex Station a large new condenser, which will be operated by a 35,000-kilowatt generator. The new equipment has a condensing capacity of 420-000 pounds of steam per hour, and is supplied with two auxiliaries for circulating the water. This condenser is one of the largest in existence.

NEWARK, N. J.—Wallington Leather Manufacturing Company, 42 Kent street, is having plans prepared for the erection of a one-story power house, about 48x115 feet, to be constructed in connection with its new plant at 317-325 Frelinghuysen avenue. The initial works are estimated to cost $40,000. It is planned to construct later a second unit of the new works, with building of increased size for the power station, the entire plant to cost about $150,000.

NEWARK, N. J.—Weston Electrical Instrument Company, 4 Weston avenue, has increased its capital stock to $1,500,000 by the issue of 5000 new shares of common stock.

NEW BRUNSWICK, N. J.—Until November 12, the Board of Freeholders will receive bids for furnishing service for street-lighting purposes for a period of five years. Asher W. Bissett, clerk.

NEWTON, N. J.—Newton Electric & Gas Company has commenced work on improvements and extensions in its system. The company is also planning for the installation of new lights in the Stewart street section, and new lines are now being strung.

PLAINFIELD, N. J.—Niles-Bement-Pond Company 111 Broadway, New York, has awarded a contract for the erection of its proposed one-story power house, about 75x100 feet at its local works. H. E. Baton, 1713 Sansom street, Philadelphia, Pa., has the contract for construction.

SPRING LAKE, N. J.—Ann May Memorial Hospital has awarded a contract for the installation of a new heating system at the institution on First avenue, to cost about $6,000. Andrew T. Van Cleve, 108 South Main street, Ocean Grove, is the contractor.

TRENTON, N. J.—Bids have been received by the City Commission for the immediate installation of a new electric lighting system in Stacy Park, from Calhoun street to the Log Basin.

WASHINGTON, N. J.—Washington Porcelain Company, recently incorporated is planning for the immediate erection of a large plant for the manufacture of electrical porcelain specialties. Herbert W. Sinclair, Frank F. Gardner, Paul Humphries, George Sinclair and A. F. Fenton, all of Trenton, are interested in the company.

WRIGHTSTOWN, N. J.—Mastbaum Brothers & Fleicher, 1424 South Penn Square, Philadelphia, Pa., have filed plans for the erection of a local one-story electric light and heating plant. Contract has been awarded to J. A. Bader & Company, Cackey Building, Wilmington, Del.

ALTOONA, PA.—Altoona & Logan Valley Electric Railway Company has issued bonds to the amount of $53,000 to provide for improvements.

CHESTER, PA.—Philadelphia Electric Company is making rapid progress in the construction of power lines from this city to Philadelphia. The wires will convey the power generated at the new $500,000 station of the company now in course of construction.

PHILADELPHIA, PA.—Winfield S. Barnes & Company, 1614 Cherry street, have had plans prepared for the construction of a power plant at their works at Frankford, near Philadelphia, which, in connection with a new shop building, will cost about $80,000.

PHILADELPHIA, PA. — Philadelphia Electric Company has made application to the Public Service Commission for permission to acquire a controlling interest in the capital stock of the Delaware County Electric Company, Lansdowne, the Bala & Merion Electric Company, and the Cheltenham Electric Light, Heat & Power Company, both of Philadelphia.

PHILADELPHIA, PA.—Philadelphia Suburban Gas & Electric Company has issued bonds to the amount of $171,000 for improvements.

PHILADELPHIA, PA.—F. A. Poth & Sons, Inc., Thirty-first and Jefferson streets, are taking bids for the erection of a two-story brick, steel and concrete addition, about 41x50 feet, to their power plant. Charles H. Caspar, 925 Chestnut street, is architect.

PHOENIXVILLE, PA.—Springfield Water Company has had plans prepared for the erection of a one-story brick, steel and stone addition to its pumping station, about 26x55 feet.

PITTSBURGH, PA. — Pennsylvania Chocolate Company, 5850 Center avenue, is having plans prepared for the installation of electrical equipment in its proposed new seven-story plant. Ballinger & Perrott, Seventeenth and Arch streets, Philadelphia, are the architects.

READING, PA.—Metropolitan Edison Company has secured a contract from the Reading Fire Brick Company for supplying power to its works to the amount of 150 horsepower. The company has also been awarded a contract by the Philadelphia & Reading Railway Company for supplying power to its local shops for 1000 horsepower. Operations have been inaugurated at the company's new power plant at West Reading, which supplies power to Lebanon, a distance of 30 miles.

READING, PA.—Reading Transit & Light Company has filed notice with the Public Service Commission of a bond issue of $3,000,000 to provide for improvements, extensions, etc.

TOPTON, PA.—Owing to the fact that another company had secured prior rights, the Town Council has been obliged to deny a franchise to the Lehigh Valley Transit Company for the erection of poles and wires to supply electric power in the Borough.

WEATHERLY, PA.—Weatherly Foundry & Machine Company is planning for the immediate erection of a large power plant for works operation.

WILLIAMSPORT, PA.—United States Rubber Company is planning for extensive additions at its local plant, to include the erection of a large power plant for works operation.

NEW CASTLE, DEL.—Wilmington Fibre Specialties Company has awarded a contract for improvements and extensions in its power plant. Harry Lynch, 715 Tatnall street, Wilmington, is the contractor.

BALTIMORE, MD.—Baltimore Dry Docks & Shipbuilding Company has taken bids for the erection of a one-story reinforced concrete and brick power house addition, about 57x69 feet, at its local plant.

BALTIMORE, MD.—Consolidated Gas, Electric Light & Power Company, Lexington Street Building, is having plans prepared for the erection of a one-story brick and concrete power house at Falls Road and Pacific avenue, Woodberry.

CHARLESTON, W. VA.—H. & S. Electric Company recently incorporated with a capital of $50,000, to manufacture electric fixtures. H. R. Stapp and Howard W. Linard are the incorporators.

FAIRMONT, W. VA.—Chesapeake & Potomac Telephone Company has completed the construction of lines between this city and Clarksburg, a distance of about 200 miles for improvements in its long distance telephone service. There are five direct and three phantom circuits between the two cities.

CHARLESTON, S. C.—United States Government, Bureau of Yards & Docks, has had plans prepared for the erection of a local power plant to cost about $100,000. F. R. Harris is chief.

HOLLY HILL, S. C.—Holly Hill Electric Service Company has incorporated with a capital of $10,000. The incorporators are B. R. Bennett, S. P. Wells and R. G. Carson.

BRUNSWICK, GA.—United States Maritime Corporation is planning for the erection of a large power plant for the operation of its shipbuilding works now in course of construction.

DUBLIN, GA.—City is planning for extensions and improvements in the municipal electric light and power plant.

CALLAHAN, FLA.—Town Council is considering ways and means for the construction of an electric lighting plant.

NORTH CENTRAL STATES.

DAYTON, O.—L-C-R Storage Battery Company has increased its capital from $30,000 to $55,000.

MINERAL CITY, O.—Zoar Battery Company, of Zoar, has franchise for furnishing Mineral City with municipal and commercial current.

WARSAW, IND.—Alpha Electric & Manufacturing Company has incorporated with a capital of $50,000. Walter Stanley, Angus C. McDonald, George Polk, John Scott and Bertram Shane are the incorporators.

CHICAGO, ILL.—American Telephone & Telegraph Company will build additional circuits between Milwaukee, in order to complete direct circuits between the latter city and Appleton and Oshkosh.

CHICAGO, ILL.—Chicago City Railway Company, Borland Building, Chicago, is planning to issue $2,172,000 bonds with which to extend its lines.

MALTA, ILL.—City is to have electric lights and council will soon let contract.

DETROIT, MICH.—Although charter amendment giving the city lighting commission authority to sell light and power to the Wayne county building will come up for vote Nov. 6, the Board of Supervisors instructed the county auditors to include in their 1917 estimates $110,000 for an independent light and power plant for the county building's needs.

ASHLAND, WIS.—Ashland Light & Power & Street Railway Company has started building a 120 horsepower plant at the mouth of the Montreal River to cost $100,000.

BELOIT, WIS.—Orn Street lighting system will be installed. Engineer Arthur J. Sweet, Palace Theater Building, Milwaukee, has prepared plans.

FOND DU LAC, WIS.—Eastern Wisconsin Electric Company has completed plans for the installation of a steam boiler of 502 horsepower in the power house at Rees and Main streets. The boiler will be equipped with automatic stokers. A smoke stack 183 feet high will be erected.

KIEL, WIS.—Kiel Woodenware Company is contemplating the erection of an addition to its generating plant to cost $65,000. Address Thomas S. Watson Company, Majestic Building, Milwaukee, Wis., consulting engineer.

MARINETTE, WIS.—Brown Mitchelson Company is contemplating the erection of an addition to its electric lighting plant.

MILWAUKEE, WIS.—Additional telephone circuits between Milwaukee and Oshkosh and between Milwaukee and Appleton are provided for by an appropriation of $17,500 recently authorized by the Wisconsin Telephone Company. Construction involves placing of poles, stringing of lines and additions to the switchboards in central offices, and is to be ready for service during December, 1917.

OOSTBURG, WIS.—Oostburg Lumber & Grain Company, a branch of Pantzer Lumber Company, is installing an electric plant to replace the old steam equipment.

ST. PAUL, MINN.—St. Paul will be asked to vote $1,200,000 in 1918 for river and harbor improvement and the construction on the river of a municipal lighting plant. City Engineer Claussen will complete plans by Dec. 2, when Commissioner Keller, the engineer, and E. F. Goltra, of St. Louis, will place them before the War Department. Plans include an electric belt line, warehouses, cold storage warehouse, grain elevator and considerable dockage. The cost is estimated at $1,000,000. The main lighting plant, which Commissioner Keller estimates would cost $200,000, will be put up to the voters at the same time, which will furnish power to city departments only.

DATES AHEAD.

Electric Power Club. Fall meeting, Hot Springs, Va., November 12-13-14.

Electrical Supply Jobbers' Association. Next meeting, Hotel Sinton, Cincinnati, Ohio, November 13-15. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago.

Ohio Society of Mechanical Electrical and Steam Engineers. Annual meeting, Columbus, O., November 15. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

American Institute of Consulting Engineers, Inc. Annual meeting, January 14. Secretary, F. A. Molitor, 35 Nassau Street, New York City.

Electrical Contractors' Association of State of Missouri. Annual convention, January 19. Secretary, A. J. Burns, 318 West Tenth Street, Kansas City, Mo.

Minnesota Electrical Contractors' Association. Annual convention, Minneapolis, Minn., January 20. Secretary, G. M. Jones, 112 South Seventh Street, Minneapolis.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, January, 1918. Secretary, L. B. Van Nuys, Central Electric Company, of Peoria, Peoria, Ill.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill.

DES MOINES, IA.—Iowa-Nebraska Coal Company has been incorporated with a capital of $125,000. Electric equipment will be purchased. The corporation will mine and sell coal. James McCauley is president.

FT. DODGE, IA.—Franchise has been granted to the Ft. Dodge Gas & Electric Company for an electric lighting system.

MIDDLETOWN, IA.—Middletown will be lighted with electricity furnished by Keokuk dam, by means of a transmission line built from Burlington, before Thanksgiving day.

SAC CITY, IA.—G. L. Long, engineer of Webster City, has been engaged to take charge of the engineering work for the construction of a municipal electric lighting plant to cost $60,000.

JOPLIN, MO.—Empire District Electric Company is planning to double the capacity of its plant at Riverton, and construction work to cost about $1,000,000 is now under way. This company is a subsidiary of the Cities Service Company, 60 Wall street, New York.

BLOOMINGTON, NEB.—The installation of an electric generator in the water works station to be driven by an engine, already installed, is under consideration.

BANTRY, N. D.—Within a short time city will be equipped with a power plant and be wired completely. A small plant has been temporarily installed and will be replaced by a larger one as soon as machinery arrives.

SOUTH CENTRAL STATES.

OWENSBORO, KY.—Rapier Sugar Feed Company, Second and Clay streets, is planning for the installation of electric motors and other electric equipment in its plant now under course of construction.

SHELBYVILLE, KY.—Surveys will begin in about 10 days for the traction line to be erected between Shelbyville and Frankfort, to connect Louisville with the Bluegrass section of the state, by the Frankfort & Shelbyville Electric Railway Company, which filed incorporation articles recently. It is estimated the line will be ready for operation in two years.

NASHVILLE, TENN.—Nashville Railway & Light Company has been petitioned to extend its railway into the Buena Vista district.

RIDGLEY, TENN.—Domestic Ridgley Light & Ice Company, with capitalization of $10,000, has been incorporated by G. S. Riley, L. J. V. Peacock, G. F. Richardson and others, to establish a light and ice plant.

JONESVILLE, LA.—City has had plans prepared for the construction of an electric plant for municipal light and power.

HAILEYVILLE, OKLA.—City is contemplating the granting of franchise to Choctaw Light & Power Company to construct an electric lighting plant.

LAWTON, OKLA.—Lawton Gas & Electric Company has incorporated with a capital of $300,000. John C. Keys is one of the incorporators.

AMARILLO, TEX.—City commission of Amarillo adopted an ordinance forfeiting the franchise of the Amarillo Street Railway Company. This property embraces nine miles of track and a well-equipped power plant. The action of the city commission in forfeiting the franchise was due to the recent suspension of the operation of cars by the company.

COOKSVILLE, TEX.—B. B. Stevens will build an electric light and power plant here for the purpose of furnishing the town and private customers with lights and power.

JEFFERSON, TEX.—Jefferson Ice & Light Company plans to install a new electric motor and other equipment in its light and power plant here.

WIERGATE, TEX.—Gulf & Northern Railway Company, which was recently incorporated here, will soon begin the construction of a railroad to run between Burkeville and Bleakwood, a distance of 25 miles. B. F. Bonner, of Houston, is a stockholder.

WESTERN STATES.

GREAT FALLS, MONT.—Montana Power Company, which is to construct a plant at Kootenai Falls that will develop 68,000 horsepower, is to construct a substation here at a cost of about $150,000, building here to be of fireproof construction, 90x148 feet.

HELENA, MONT.—Montana Power Company is to develop 68,000 horsepower at Kootenai Falls at a cost of $6,000,000. The plant is to have a head of 110 feet. Preliminary work has been completed and plans are now ready for contractor's figures.

WHITEFISH, MONT.—A. P. Tills of Kalispell, representative of Northern Idaho & Montana Power Company, has been circulating a petition among property owners here with a view to installing a better lighting system.

KINGMAN, ARIZ.—E. H. Carpenter is drawing plans for an electric plant to generate electricity for the whole of northwest Arizona.

YUMA, ARIZ.—Southern Sierras Power Company, 611 Symes Building, Denver, Colo., is planning to erect an electric transmission line from Yuma to mines of New Cornelia Copper Company at Ajo, about 160 miles. C. O. Pool, First National Bank Building, Riverside, Cal., is chief engineer.

YUMA, ARIZ.—T. E. Trask, of Los Angeles, Cal., has been asked by the City Council to obtain an option on the existing water, power, light and gas plants in Yuma as a basis for an action in the direction of municipal ownership. The Council has called an election to vote on an issue of bonds to the amount of $300,000 for the purchase of the old plants or the installation of new ones.

OGDEN, UTAH.—Utah Light & Power Company has applied for a franchise through a portion of Glenwood, Utah.

ELY, NEV.—Frank B. Ench, of Oakland, Cal., announces plans for a hydroelectric plant to provide power for the copper mines at Ely, Nev. An initial installation of 4800 horsepower to cost $1,200,000 and a later development of 10,000 horsepower is called for.

CATALDO, IDA.—Washington Water Power Company, of Spokane, is planning to build a 45-mile electric transmission line from Cataldo via Fourth July Canyon to Coeur d'Alene. Estimated cost $200,000.

OROVILLE, WASH.—Ordinance granting a 15-year franchise to the Okanigan Valley Power Company has passed the Council.

SEATTLE, WASH.—Ordinance has been introduced in the city council proposing to issue $40,000 in city railway bonds for the purpose of building the Ballard extension of the city railway line, work upon which was discontinued some days ago by injunction.

SEATTLE, WASH.—Puget Sound Company, which proposes the construction of a large paper mill near Port Angeles, Wash., has applied to the Mason County Commissioners at Sheldon, Wash., for a 50-year franchise for a power line.

TACOMA, WASH.—Commissioner H. F. Gronen is preparing a report on the proposed power site at Lake Cushman, to be presented to City Council. The report embodies investigations as to the construction of a municipal power plant at Lake Cushman, which would cost, it is estimated, close to $3,000,000.

VICTORIA, B. C., CANADA.—Kootenay Power Company announces that it will spend $2,500,000 in building a high-tension power line from the end of its boundary system in the vicinity of Greenwood, and west as far as Copper Mountain.

ECHO, ORE.—Echo Commercial Club and city council will install cluster lights on the streets this winter.

BRAWLEY, CAL.—City Engineer has been instructed to report on the feasibility and cost of installing a municipal electric plant.

FORT BRAGG, CAL.—Exhaust steam from the power plant of the Union Lumber Company, will be utilized to run a pressure generator capable of generating 750 kilowatts of electricity.

FRESNO, CAL.—City Trustees have ordered the installation of electroliers on both sides of Fresno street.

FRESNO, CAL.—San Joaquin Light & Power Corporation has purchased the Merced Stone Company's power plant and lines at Kittredge, Cal., and will extend the power lines to Coulterville, as well as to several mining claims.

MERCED, CAL.—Plans are now under way for the increasing of the capacity of the local substation of the San Joaquin Light & Power Corporation from 1200 kilowatts to 2400 kilowatts.

OROVILLE, CAL.—Owners of the Bloomer Quartz Mine plans the erection of a large hydroelectric plant.

PETALUMA, CAL.—Pacific Fire Extinguisher Company has been awarded a contract to install conduits for electroliers along certain streets in this place.

SAN FRANCISCO, CAL.—State Railroad Commission has authorized San Joaquin Light & Power Company to operate under a franchise, granted it by Mariposa County last July, in that portion of the country not served by any other utility of like character.

INCORPORATIONS

WILMINGTON, DEL.—Rubber Insulated Metals Corporation. Capital, $500,000. To manufacture electrical preparations for insulated wires, etc. Incorporators: M. M. Clancy, C. M. Egner, and C. L. Rimlinger, Wilmington.

CHICAGO, ILL.—Ring Spark Plug Company. Capital, $6000. Incorporators: J. H. Daly, C. W. Tarbet and W. E. Weatherly.

SAYBROOK, ILL.—Saybrook Telephone Company. Capital $16,000. Incorporators: J. A. and S. A. Brown.

INDIANAPOLIS, IND.—Steel Manufacturing Company has incorporated with a capital of $50,000 to manufacture electrical devices for automobiles. The directors are Ben Steele, G. D. Yaeger and Frank Fertig.

IOWA FALLS, IA.—Iowa Falls & Ellis Mutual Telephone Company. Capital, $10,000. Incorporators: R. J. Broddy, president, and Charles H. Sanders, secretary.

FRANKFORT, KY.—Frankfort & Shelbyville Electrical Railway Company. Capital, $500,000. Incorporators: P. P. Philipp, F. W. Henkel, E. H. Brown, Jr.

MORRISTOWN, N. J.—New Jersey Gas & Electric Company. To operate a plant for the generation of electricity and the manufacture of gas. Edwin Hawley Van Wyck is president.

NEW YORK, N. Y.—Empire Electric Steel Corporation. Capital $500,000. To manufacture steel by special process. Incorporators: E. H. Rapp, E. Pusinelli and G. R. Hamilton, 2 Rector Street.

NEW YORK, N. Y.—Martin McHollan Company. Capital $50,000. To engage in a general electrical and mechanical engineering business. Incorporators: J. A. McHollan, G. W. Martin and F. E. Anderson. 9 West Ninety-first Street.

NEW YORK, N. Y.—Weyant Electrical Company. Nominal capital, $5000. To manufacture electrical supplies. Incorporators: C. E. Wallace, W. L. Clark and W. G. Miller, Jr., 92 William Street.

JEFFERSON, N. C.—Ashe Telephone Company. Capital, $25,000. To operate a telephone exchange plant. Incorporators: L. L. Perkins, E. Perkins and W. R. Baugess.

CLEVELAND, O.—Willis Manufacturing Company. Capital, $100,000. Incorporators: Herbert A. Spring, Howard F. Burns, M. G. Egan, M. I. Scott and L. A. O'Neill.

EAST LIVERPOOL, O.—Steubenville, East Liverpool & Beaver Valley Traction Company has incorporated with a capital of $4,600,000. J. H. Maxwell and others are the incorporators.

CLEARFIELD, PA.—North Mahoning Township Light, Heat & Power Company. Capital, $5000. To operate in Clearfield county. W. O. Hoover, treasurer.

PINEVILLE, W. VA.—Wyoming Telephone Company. Capital, $10,000. To operate a telephone exchange plant. Incorporators: H. W. Whitehead, James Damron, Guy White, B. Taylor and Thomas Hatfield, Williamson.

MENASHA, WIS.—Twin Cities Electric & Supply Company. Capital, $5000. Incorporators: Joseph Hill, Victor M. Gombert and Flora W. Gombert.

RACINE, WIS.—Electrical Construction Company has incorporated with a capital of $18,000. Incorporators are Charles F. Brietzke and William B. Pierce.

PROPOSALS

ELECTRICAL EQUIPMENT.—Sealed bids will be received by the Mayor and Board of Commissioners at Charleston, Miss., until Nov. 20 for furnishing materials, equipment and supplies for constructing certain water works and electric light improvements. The water works improvements include furnishing oil engines, pumps, deep well, reservoir, elevated tank and oil-storage facilities. Electric light improvements include furnishing alternators and miscellaneous line materials. Plans and specifications are on file in the office of the Board of Commissioners at Charleston.

GLUE POTS.—Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on 36 electric portable glue pots of two-quart capacity, for delivery at Philadelphia, Pa., schedule 1551.

POWER AND WATER SYSTEM.—Citizens of Hailey, Ida., will vote about Nov. 15 on a bond issue of $80,000 for the construction of power and water system.

WATERWORKS SYSTEM.—Bids will be received until Nov. 15 by F. L. Stebbins, Lakeview, Mich., for waterworks system, including steel tank and tower, motor and pump, total cost $11,500.

ELECTRICAL EQUIPMENT. — Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until 11 a. m., Dec. 10, for installing pumps, motors, piping, distributing connection, etc., for foam fire protection system for fuel oil and gasoline tank and reservoirs at the naval station at Guantanma, Cuba.

LIGHT AND WATER PLANT.—Bids will be received by A. Joost, city clerk, Pender, Neb., until Nov. 8, for constructing a municipal light and water plant. Henningson Engineering Company, Omaha, Neb., engineers.

LIGHTING FIXTURES.—Bids will be received soon at Wichita, Kans., for a white way, containing nine, and one containing five lighting standards. Bids must be accompanied by certified check for $25. H. D. Lester, clerk, and P. L. Brockway, engineer.

Electrical Patents Issued October 23, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,243,700. Manually-Operated Electric Coupling. T. R. Brown, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Structure of electric train pipe coupling.

1,243,703. Window-Heater. W. C. Burmeister and E. N. Smock, Chicago, Ill. Electric heater with apparatus for holding it against a pane.

1,243,705. Method of and Means for Transmitting Signals. J. R. Carson, assignor to American Telephone & Telegraph Co. High frequency wireless telephone system.

1,243,721. Measured-Service Telephone System. J. Erickson, assignor to Automatic Electric Co. Toll station apparatus for automatic system.

1,243,722. Electric Switch. C. T. Evans, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Details of electromagnetically operated structure.

1,243,738. Electric Regulator. G. Honold, assignor to Firm of R. Bosch, Stuttgart, Germany. Structure of electromagnetically controlled compression resistance.

1,243,747. Telephone Trunking System. F. Libberger, assignor to Automatic Electric Co., Chicago, Ill. Grouping of trunks, etc., in automatic system.

No. 1,243,800—Conduit Rosette Outlet Box.

1,243,748. Connector for Electrical Conduits. A. McMurtrie, New York, N. Y. For connecting a conduit end with a junction box or the like.

1,243,749. Measured-Service Telephone System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Automatic system.

1,243,755. Telephone. F. C. C. V. Naeserand, N. A. J. Lilliendahl-Petersen, Copenhagen, Denmark. Special structure of loud speaking receiver.

1,243,761. Automatic Telephone System. F. R. Quayle, assignor to Automatic Electric Co., Chicago, Ill. Manner of grouping, selection and connection of trunks.

1,243,722. Signaling-Horn. C. H. Smith, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Has diaphragm operated by electromagnet.

1,243,774. Electric Conducting Ground-Rod. G. W. Soengen, Kirkwood, Mo. Tube driven into ground contains conducting strands and explosive which blows strands laterally into the earth.

1,243,782. Automatic Train Control. W. V. Turner, assignor to Westinghouse Air

Brake Co. Brakes are controlled by electric conditions along track.

1,243,789. Valve-Receiver for Wireless Signals. G. M. Wright, assignor to Marconi Wireless Telegraph Co. of America, New York, N. Y. Arrangement of three-element, vacuous detector.

1,243,795. Method of Building Commutators. V. G. Apple, Dayton, Ohio. Segments are formed from ends of armature conductors which are built up by applying comminuted metal thereto.

1,243,800. Electrical Fixture. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. For suspending a lamp cord from a conduit outlet.

1,243,807. Rectifier. H. E. Burkett, assignor one-half to E. E. Lynch, Leavenworth, Kans. Commutating device.

1,243,824. Vehicle-Signal. G. Woodbridge, El Paso, Tex., L. C. Edmond executor of said G. W. Edmond, deceased. Electromagnetically operated direction indicator.

1,243,825. Scraping and Cleaning Device. L. Escutchen, Philadelphia, Pa. Hand implement, comprises motor driven rotary brush.

1,243,832. Train-Stop Apparatus. L. A. Gladding, New Milford, Conn., and J. H. Sullivan, Newport, R. I. Electromagnetic control of actuator for controller.

1,243,840, 1,243,850 and 1,243,851. Fuse-Plug. W. S. MacLewee, assignor to C. H. MacLewee, Yardley, Pa. Details of construction.

1,243,852. Multitime Separator and Distributor. D. L. Martyn, North Yakima, Wash. Annunciating system.

1,243,875. Apparatus for Starting Internal Combustion Engines. J. R. Price, assignor Price Electric Device Corp., Basic City, Pa. System comprising dynamo machine operated from or charging a battery together with a vaporizer and automatic control of fuel supply.

1,243,902. Electric Conduit Fitting. S. B. Van Ranst, assignor to Crouse-Hinds Co., Syracuse, N. Y. For attaching an electric appliance.

1,243,915. Audible Indicating Device. H. A. Barnes, Denver, Colo. For push switches.

1,243,922. Cordless Telephone-Switchboard. M. L. Currier, Cottleville, Mo. Arrangement of connecting strips and jack sockets.

1,243,930. Lamp. L. M. Giroux, New York, N. Y. Elongated structure adapted to emit light through lenses at its ends and prisms at its sides.

1,243,966. Dynamo-Electric Machine. L. C. Nichols, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Structure of field pole.

1,243,968. Electric Fan. G. Olson, assignor one-half to W. M. McEwen, Chicago, Ill. Structural details of air circulating device.

1,243,976. Process for Separation of Gold and Silver from Minerals. R. Reyes, Mexico, Mexico. Minerals in finely divided condition are added to sodium chlorid solution which is then electrolyzed and the metals are deposited on the cathode.

1,243,977. Apparatus for the Chlorination of Minerals. R. Reyes. Structure of electrodes and electrolytic tank.

1,244,012. Process of Treating Liquids. F. R. Bachler, and W. B. Newkirk, assignors one-third to A. T. Gibson, Oxnard, Cal. Electrolytic process.

1,244,013. Vibratory Bell. A. Bagutti, Turin, Italy. Structural details of electromagnetically operated device.

1,244,015. Static-Electricity Dissipation for Webs or Sheets. H. M. Barber, assignor to C. B. Cottrell & Sons Co., New York, N. Y. An electromagnet controlled by the press starter moves a moistener into and out of contact with the web.

1,244,036. Defensive Implement. J. Darmofalski, Middlefield, Conn. An implement having magnetic prongs is hinged to a support adapted to be held in position by driving into the earth.

1,244,045. Automobile. R. S. Fend, assignor to Woods Motor Vehicle Co., Chicago, Ill. Relates to gearing between engine and dynamo.

1,244,048. Carbon Holder for Arc Lights. J. Gelb, New York, N. Y. Structural details.

1,244,049. Spark Coil Testing Device. H. P. Goerz, Marion, S. D. Structure of support and arrangement of terminals and connections.

1,244,055. Electric Cloth-Cutting Machine. A. P. Komow, assignor to U. S. Cloth Cutting Machine Co., Inc., New York, N. Y. Details of rotary knife structure.

1,244,081. Time-Calling Device for Telephones. E. Rogers, assignor one-half to T. J. Martin, Chicago, Ill. Audible signal mechanism is rendered active by closing the telephone circuit.

1,244,085. Switch. G. W. Hart, assignor to Hart Mfg. Co., Hartford, Conn. Details of solenoid operated structure.

1,244,091. Spark-Plug. W. G. Jackson, Rockford, Ill. Structure details.

1,244,099. Test-Connector for Electric Wires. A. Kneisel, Cleveland, O. A strap connector for connecting two wire ends and permitting connection of a third wire.

1,244,110. Switch. W. R. McNary, Detroit, Mich. Structure of automatic switch for a vehicle signal.

1,244,118. System of Lightning-Conductors. G. A. Mullen, Woodbury, N. J. Comprises metallic grids across chimney openings connected by a bar having a discharge point and connected with ground.

1,244,121. Metallic Vapor Lamp. W. Nerust, assignor to Deutsche Gas Gluhlicht Aktiengesellschaft, Berlin, Germany. Relates to structure of tube and arrangements for cooling and starting.

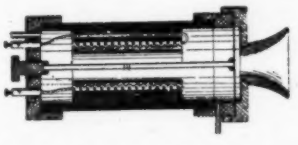
1,244,124. Spark Producing and Distributing Apparatus for Explosive-Motors. V. Paquit, Stapleton, N. Y. Structure comprising a coil and condenser and special structure of rotary distributer.

1,244,138. Track-Switch. C. W. Squires, Beverly, Mass. Details of electromagnetic operating means controlled by trolley.

1,244,150. Method of Changing Resistance in a Circuit and Apparatus Therefor. E. Weintraub, assignor to Submarine Signaling Co., Portland, Me. For use in microscopic circuits.

1,244,155. Circuit-Breaker for Ignition Systems. J. A. Williams, Cleveland, O. Details of cam operated structure.

1,244,159. Photometer. F. W. Adsit, Chicago, Ill. Apparatus including a wheatstone bridge for determining the film affecting light quality of a scene to be photographed.



No. 1,244,150—Coil for Submarine Signal.

1,244,164. Electric Clock. G. Blumberg and J. A. Butkus, Baltimore, Md. Structure of solenoid operated mechanism.

1,244,200. Headlight. A. E. Hale, Tucson, Ariz. Arrangement of reflectors.

1,244,204. Railway-Crossing Signal. J. F. Hawley and F. L. Moss, Chillicothe, Mo. Train actuated; has a pair of selectively actuated signals at the crossing.

1,244,207. Generator Drive Mechanism. A. G. Herreshoff, assignor to International Motor Co., New York, N. Y. For driving from internal combustion engine.

1,244,211. Elevator Safety System. H. G. Hillman, assignor to J. T. Clarke, New York, N. Y. Arrangement whereby door controls power circuit and notifies operator of a dangerous condition.

1,244,216. Election-Discharge Apparatus and Method of Preparation. I. Langmuir, assignor to General Electric Co. Has a special cattrode of tungsten with a surface film of thorium.

1,244,217. Electron Discharge Apparatus and Method of Operating the Same. I. Langmuir, assignor to General Electric Co. Comprises an envelope containing potassium and one electrode being largely of tungsten and containing thorium.

1,244,225. Circuit Breaker. W. S. Mayer, assignor to D. & W. Fuse Co., Providence, R. I. Switchboard structure of the carbon break, edgewise type.

1,244,234. Electric Heater for Carburetor Air-Intakes. J. M. Nater, West Hoboken, N. J. Is mounted in the valve.

1,244,260. Igniter Mechanism for Internal Combustion Engines. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Structure of make-and-break type, including magnets.

1,244,261. Ignition Device. H. R. Van Deventer, assignor to Splitdorf Electrical Co. Structure mounted on cylinder head comprises a spark plug and a generator operated by a plunger pushed by the engine piston.

1,244,262. Generator-Lamp. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Device for bicycles, etc., includes a head light and generator.

1,244,332. Fire-Alarm System. H. R. Hughs, and W. C. Hughs, Walhalla, S. C. Details of annunciator system for indicating location of compartment where fire exists.

1,244,334. Protective Device for Ventilating Fans. R. A. Ilg, Chicago, Ill. Has provision for protecting the motor from foul gases drawn through the fan.

1,244,339. Snap Clamp or Grip for Electrical Conductors. T. F. Johnson, Jr., Atlanta, Ga. For connecting a cable at any point with a line or trolley wire.

1,244,346. Fuse. G. A. Ley, Chicago, Ill. Arrangement for electrically igniting an inflammable head.

1,244,358 and 1,244,359. Arc-Lamp Electrode. W. R. Mott, assignor to National Carbon Co., Inc. First patent: contains sodium uranium fluorid and carbon. Second patent: contains carbon, calcium fluorid, rare earth metal fluorid and barium sulfate.

1,244,408. Coin-Controlled Circuit-Controller. V. R. Bacon, Florence, Nebr. Details of chronometer controlled mechanism.

1,244,415. Electric Furnace and Method of Operation. W. K. Booth, assignor to Booth-Hall Co., Chicago, Ill. Structure of furnace and arrangement of electrodes.

1,244,416. Spark Plug. A. P. Broomell, York, Pa. Details of construction.

1,244,420. Railroad-Gate. H. Carlisle, assignor to C. E. Simpson, Hammonton, N. J. Train controlled solenoid controls pneumatically operated crossing gate.

1,244,425. Battery-Tester. E. L. Clark, Lakewood, Ohio, assignor to National Carbon Co., Inc. Gives an audible indication.

1,244,433. Telephone-Mouthpiece. G. Dorsky, Seattle, Wash. Antiseptic structure.

1,244,441. Auto-Light Dimmer. A. J. Frascolla, New York, N. Y. Resistance device.

Reissues.

14,380. System for the Transmission of Intelligence. E. H. Colpitts, assignor to American Telephone & Telegraph Co. Embodies repeaters of the Audion type.

14,381. Traction-Meter. J. G. Kjellgren, Cleveland, Ohio. Meter for electric tractors.

Patents Expired.

The following United States electrical patents expired on November 6, 1917:

661,049. Controlling End Play of Rotary Machines. E. M. Hewlett, Schenectady, N. Y.

661,085. Process of Making Accumulator Plates. Z. Stanecki, Lemberg, Austria-Hungary.

661,107. Carbon Fencil or Electrode for Electric Lights. J. F. Sanders, Chicago, Ill.

661,125 and 661,126. Electric Arc Lamps. J. A. Heany, Philadelphia, Pa.

661,127. Electrical Measuring Instrument. F. A. LaRoche, New York, N. Y.

661,165. Protecting Underground Metallic Structures from Effects of Electrolysis. L. I. Blake, Lawrence, Kans.

661,173. Electric Call or Signal Box. G. G. Glenn and W. S. Sullivan, Philadelphia, Pa.

661,195. Automatic Magnetic Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

661,196. Rheostat and Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

661,222. Method of Governing Prime Movers. R. D. Mershon, New York, N. Y.

661,224. Telephone Arm. H. McDonald, Williamsport, Pa.

661,227. Commutator Collector. H. G. Reist and E. L. Aiken, Schenectady, N. Y.

661,228. Adjusting Brush Holders. H. G. Reist, Schenectady, N. Y.

661,241. Thermal Cutout or Fuse. O. Feuerlein, Charlottenburg, Germany.

661,243. Lamp Guard. E. Gahlau, Detroit, Mich.

661,244. Electric Cable. W. M. Habirshaw, New York, N. Y.

661,250. Process of Manufacturing Thin Homogeneous Plates. L. Lombardi, Turin, Italy.

661,260. Transmitter. R. H. Ferguson, Baltimore, Md.

661,292. Dynamo-Electric Machine. J. F. Kelly, Pittsfield, Mass.

661,306. Dynamo-Electric Machine. C. C. Chesney, Pittsfield, Mass.

661,335. Electromechanical Clutch. R. E. Cryder, Chicago, Ill.

661,456. Electric Candlestick. L. F. Lewis, New York, N. Y.

661,458. Current Distributer for Electric Railways. H. Schramm, Nuremberg, Germany.

661,464 Alternating-Current Motor. W. Aldrich and H. E. Borger, Dayton, O.

661,465. Electrical Switch. N. Bassett, Philadelphia, Pa.

Financial News and Comment

Copper Exports.

Copper exports to France during the first seven months of this year amounted to 230,891,808 pounds, as compared with 221,488,642 pounds consigned to England. Prior to the outbreak of the war Germany was the heaviest buyer of American copper, taking large tonnages through Holland as well as importing direct through her own ports of entry.

Up to August 1 there had been exported from the United States a total of 677,274,310 pounds against 455,103,047 pounds in the corresponding period of the preceding year and 595,967,518 pounds two years ago.

The export record appears below (in pounds):

	1917	1916
January	114,960,987	56,611,532
February	72,278,886	56,100,194
March	114,734,114	64,991,611
April	110,959,215	46,820,611
May	110,881,582	74,147,232
June	92,241,623	79,890,231
July	61,433,419	76,611,636

In addition to the copper exported as such there was a large tonnage sent abroad in various forms of munitions and brass. Over 283,000,000 pounds of brass were sent out in the seven months' period under review.

Reports of Earnings.

Electric Bond and Share.

Earnings of subsidiaries of Electric Bond & Share Company compare as follows:

Carolina Power & Light Company:

	1917	1916
September gross	$ 73,303	$ 66,027
Net after taxes	28,590	21,056
Total income	62,758	36,056
Surplus after charges	49,503	21,839
12 months' gross	886,871	761,335
Net after taxes	324,079	287,766
Total income	452,897	364,316
Surplus after charges	281,332	194,429

Ashville Power & Light Company:

	1917	1916
September gross	$ 43,873	$ 41,588
Net after tax	20,664	16,771
Surplus after charges	16,191	12,755
12 months' gross	494,588	448,583
Net after taxes	214,505	189,761
Surplus after charges	160,118	139,320

Yadkin River Power Company:

	1917	1916
September gross	$ 37,277	$ 41,629
Net after taxes	26,980	33,067
Surplus after charges	18,348	17,441
12 months' gross	476,572	402,500
Net after taxes	349,452	289,249
Surplus after charges	180,338	102,427

Allis-Chalmers Manufacturing Company.

Allis-Chalmers' statement for the third quarter of the fiscal year, while not up to figures of the preceding quarter, nevertheless is highly encouraging, especially in view of the increasing cost of material and labor tending to keep profits down.

	1917	1916
Net profits for third quarter	$ 919,404	$ 545,199
First nine months' net profits	2,822,531	2,236,297
Total sales for three quarters	17,912,375	13,698,830

Based on earnings shown for first nine months of year the company should come through the year with at least $3,763,000 for the preferred stock equivalent to 22.80 per cent on the full issue of $16,500,000. This would leave $2,608,000 applicable to common, or at the rate of 10.03 per cent for the year. There is still due 7.85 per cent back dividends on preferred which the company has been paying off at the rate of ¾ of 1 per cent each quarter.

American Power and Light Company.

Earnings of all properties controlled by Southwestern Power & Light Company, a subsidiary of American Power & Light, compares as follows:

	1917	1916
September gross	$ 395,473	$ 371,104
Net earnings	189,748	191,977
Twelve months' gross	4,513,004	4,080,604
Net earnings	2,086,148	1,932,412

Central States Electric Corporation.

	1917	1916
*September gross	$ 527,813	$ 387,370
Net after taxes	173,568	162,104
Surplus after charges	96,379	82,543
*Nine months' gross	4,769,339	3,630,408
Net after taxes	1,386,679	1,700,576
Surplus after charges	539,030	997,204
*Twelve months' gross	6,248,669	4,827,782
Net after taxes	1,812,786	2,170,201
Surplus after charges	693,435	1,140,780

*Earnings subsequent to April 25, 1914, are subject to adjustment after decision in pending rate proceedings, the exact result of which cannot now be determined.

Cumberland County Power and Light Company.

	1917	1916
September gross	$ 281,195	$ 270,012
Net after taxes	121,705	114,437
Surplus after charges	51,475	45,339
Twelve months' gross	3,049,224	2,803,676
Net after taxes	1,047,853	1,101,823
Surplus after charges	233,038	299,516
Balance after preferred dividends	95,038	161,516

Southern California Edison Company.

	1917	1916
September gross	$ 600,166	$ 703,630
Net after taxes	361,595	427,926
Total income	450,286	452,253
Bal. after interest	241,077	264,024
Total balance	*264,949	264,024
Nine months' gross	5,652,132	6,132,482
Net after taxes	3,483,022	3,630,298
Total income	3,918,584	3,814,462
Balance after interest	2,153,667	2,088,163
Total balance	*2,271,446	2,088,163

*Includes $23,672 additional revenue credited to depreciation reserve under contract with City of Los Angeles for September, and $117,778 since May 1, 1917.

Portland Railway, Light & Power Company.

	1917	1916
September gross	$ 501,149	$ 453,731
Net after taxes	201,999	209,538
Surplus after charges	24,454	30,727
Twelve months gross	5,833,067	5,422,757
Net after taxes	2,635,614	2,369,966
Surplus after charges	470,494	190,234

Montana Power Company.

Earnings of Montana Power Company and subsidiary companies, for three and nine months ended September 30, compare as follows:

	1917	1916
Three months' gross	$1,505,417	$1,507,967
Net after taxes	1,047,394	1,141,294
Surplus after charges	693,574	825,031
Nine months' gross	5,140,163	4,411,721
Net after taxes	3,750,405	3,357,794
Surplus after charges	2,718,103	2,376,636

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECERICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Oct. 30.	Bid Nov. 6.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	..	14	13
Adirondack Electric Power of Glens Falls, preferred	6	65	62
American Gas & Electric of New York, common	10+extra	95	95
American Gas & Electric of New York, preferred	6	42	40
American Light & Traction of New York, common	..	210	203
American Light & Traction of New York, preferred	6	99	96
American Power & Light of New York, common	4	49	30
American Power & Light of New York, preferred	6	75	74
American Public Utilities of Grand Rapids, common	..	24	26
American Public Utilities of Grand Rapids, preferred	6	58	57
American Telephone & Telegraph of New York	..	..	110½
American Water Works & Elec. of New York, common	..	4½	4
American Water Works & Elec. of New York, particip	7	11	10
American Water Works & Elec. of New York, first preferred	..	60	59
Appalachian Power of Bluefield, common	..	2	1
Appalachian Power of Bluefield, preferred	7	25	20
Cities Service of New York, common	+extra	208	200
Cities Service of New York, preferred	6	77¾	76 1/6
Commonwealth Edison of Chicago	8	108½	105½
Comm. Power, Railway & Light of Jackson, common	4	38	38
Comm. Power, Railway & Light of Jackson, preferred	6	68	68
Federal Light & Traction of New York, common	..	7	5
Federal Light & Traction of New York, preferred	..	32	25
Illinois Northern Utilities of Dixon	6	75	75
Middle West Utilities of Chicago, common	2+2 extra	33	32
Middle West Utilities of Chicago, preferred	6	55	60
Northern States Power of Chicago, common	ex div.7	68	58
Northern States Power of Chicago, preferred	ex div.7	90	88
Pacific Gas & Electric of San Francisco, common	5	39¼	37½
Pacific Gas & Electric of San Francisco, preferred	6	85½	81
Public Service of Northern Illinois, Chicago, common	7	75	74
Public Service of Northern Illinois, Chicago, preferred	6	90	90
Republic Railway & Light of Youngstown, common	4	25	20
Republic Railway & Light of Youngstown, preferred	6	63	57
Standard Gas & Electric of Chicago, common	..	6	5
Standard Gas & Electric of Chicago, preferred	6	28	27
Tennessee Railway, Light & Power of Chattanooga, common	..	2¾	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	18	10
United Light & Railways of Grand Rapids, common	4	30	30
United Light & Railways of Grand Rapids, preferred	6	63	59
Western Power of San Francisco, common	..	10	8
Western Power of San Francisco, preferred	6	47	45
Western Union Telegraph of New York	extra	84	82
Industrials—			
Electric Storage of Philadelphia, common	4	52	48½
General Electric of Schenectady	8	130	128
National Carbon of Cleveland, common	8	63	55
National Carbon of Cleveland, preferred	..	130	120
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	42	37
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55

*Last sale.